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U.S. Army Environmental Center

FORT DEVENS SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY MASSACHUSETTS
REMEDIAL (DATA GAP) INVESTIGATIONS
OF
AREA OF CONTAMINATION A4
AND
AREAS OF CONTAMINATION A7/A9
(MANAGEMENT-OF-MIGRATION OPERABLE UNIT)
AND
SUPPLEMENTAL SITE INVESTIGATIONS OF
SELECTED STUDY AREAS

FINAL TASK ORDER WORK PLAN
DATA ITEM A005

CONTRACT DACA31-94-D-0061

U.S. ARMY ENVIRONMENTAL CENTER
ABERDEEN PROVING GROUND, MARYLAND

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FINALIZATION OF SELECTED STUDY AREAS
FORT DEVENS SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY MASSACHUSETTS

FINAL TASK ORDER WORK PLAN
DATA ITEM A005

CONTRACT DACA31-94-D-0061

Prepared for:

COMMANDER
United States Army Environmental Center
Aberdeen Proving Ground, Maryland

Prepared by:

ABB Environmental Services, Inc.
Portland, Maine

MAY 1996

TASK ORDER WORK PLAN
FORT DEVENS SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY MASSACHUSETTS

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1.0 INTRODUCTION

ABB Environmental Services, Inc. (ABB-ES) will conduct remedial (data gap) investigations (RIs) at the following areas of contamination (AOCs) and will conduct supplemental site investigations (SSIs) at the following study areas (SA) at the Fort Devens Sudbury Training Annex (Sudbury Annex):

AREA OF CONTAMINATION	A4	Waste Dump
	A7/A9	Management-of-Migration (i.e., Groundwater) Operable Unit (OU)
STUDY AREA	P1	UST Across from Building 223
	P4	Bunker Dump Area
	P17	Building T206 Cloth Burial Area
	P20	Burned Area and Drum
	P22	Old Gravel Pit
	P35	Main Gate Guard Shack
	P59	Can Area
	P60	Patrol Road Dump

The investigations will be conducted in accordance with the plans and rationale presented herein and in conformance with the methods, procedures, and requirements set forth in the Project Operations Plan (POP) (ABB-ES, April 1995a).

1.1 PURPOSE AND SCOPE

The purpose of this Work Plan is to provide a basis and plan for collecting additional required data at the identified sites.

The RIs will focus on providing additional information on the presence, extent, and concentrations of certain contaminants in specific areas near the subject

AOCs. These data will be compared to previously calculated human health and ecological quantitative risk assessments in technical memoranda for the A4 and A7/A9 AOCs. For the Management-of-Migration OU at AOCs A7/A9, the data will also be incorporated as appropriate in an addendum to the current Feasibility Study (FS) (OHM, May 1995).

Additional SSI field investigations will be conducted at SAs P20, P22, and P59. The collection of additional data is not required for SAs P1, P4, P17, P35, and P60. All available data for each SA will be evaluated along with the previously acquired data for each SA in recommending: 1) no further action (NFA); 2) a removal action; 3) inclusion in a facility-wide arsenic investigation; or 4) a remedial investigation (RI). Human health and ecological preliminary risk evaluations (PREs) will be performed as part of the SSIs for all eight SAs.

The planned RI data-gap investigations and SSIs will consist of field observations and measurements, the collection of environmental samples, and chemical analysis of the samples. Locations of the sites at which ABB-ES will undertake the investigations are shown in Figure 1-1.

1.2 Physical Setting and History

The following subsections describe the physical setting and history of Sudbury Annex.

1.2.1 Physical Setting

Sudbury Annex is located in Middlesex County, Massachusetts, in the towns of Stow, Maynard, Sudbury, and Hudson. The facility covers a total of approximately 2,750 acres, and is divided into a north section and a separate and smaller south section (Dames & Moore, 1992) (Figure 1-1). Sudbury Annex is in the coastal lowland near the transition to the central upland physiographic region of New England. Its terrain is characterized by broad valleys and low, rounded hills (Hansen, 1956). Ground elevations range from approximately 180 feet to approximately 320 feet above mean sea level.

The topography was formed by glacial processes. In general, the valleys are outwash plains consisting of stratified sand and gravel. The ground surface in the

valleys is typically swampy, and kettle holes are occupied by ponds. Beneath all or part of the valleys, the outwash deposits overlie till. Vose Hill (in the northeastern part of Sudbury Annex) and an unnamed hill immediately south of Tuttle Hill (in the northern part of Sudbury Annex) were mapped by Hansen (1956) as drumlins (ellipsoidal features consisting largely of till and indicating by their orientation the general direction of ice movement). The other hills at Sudbury Annex are bedrock features mantled by a comparatively thin deposit of ground moraine (till).

Bedrock units underlying Sudbury Annex are part of what is known as the Nashoba block, which is characterized by rocks of high metamorphic grade ranging in age from late Precambrian to Silurian (1.2 billion to 400 million years old). At Sudbury Annex, these rocks consist of gneiss, amphibolite, and intrusives varying from granitic to dioritic in composition (Zen, 1983). The bedrock strikes northeastward.

The land surface is drained by several small, slow-flowing tributaries of the Assabet and Sudbury Rivers. Several miles to the north, the Assabet and Sudbury Rivers join to form the Concord River. Groundwater at Sudbury Annex flows generally in conformance with the topography, with flow from higher ground into the valleys.

1.2.2 History of Sudbury Annex

Sudbury Annex became a military facility in 1942. Prior to that time it was privately owned and was used primarily for farming. Some of the land was also used for industrial purposes (Diamond Match Co., Maynard Woolen Mills). Its subsequent use is summarized as follows, based on the Phase II site investigation (SI) report (E&E, September 1994):

1939-1952. The Army acquired the property between 1939 and 1942. During World War II it was used to store surplus ammunition. The facility was originally known as the Maynard Ammunition Backup Storage Point (MABSP), and it later was called the Maynard Ammunition Sub-Depot (MASD). In 1946 it became part of Watertown Arsenal and was called Watertown Arsenal (Maynard). In 1950 it was transferred to the First Army, and it became a subinstallation of Fort Devens for storage and training until 1952.

1952-1957. Although training continued, starting in 1952 it was used mostly for ordnance research and development under the Chief of Ordnance, by Universal Match Corporation and the Arthur D. Little Company (ADL). It was renamed the Maynard Ordnance Test Station (MOTS).

1958-1982. Control was transferred to the Quartermaster Research and Engineering Center at Natick. Troop training continued, and the facility was used for field testing of experiments developed at Natick and by other agencies and operators, related primarily to materials testing. In 1962 control of Sudbury Annex was transferred to Natick Laboratories, and, in 1976, control was given to Natick Research and Development Command (NARADCOM).

1982-present. In 1982 Fort Devens received custody of the entire Sudbury Annex. Since then, it has been used primarily for personnel training activities for active and reserve military units and for National Guard troops.

There are no current industrial operations or other waste-producing operations at Sudbury Annex.

Under the Defense Base Realignment and Closure Act of 1990, Fort Devens was identified for closure and for retention of 4,600 acres to establish a Reserve Component enclave and regional military training center. Fort Devens closed on 30 March 1996. Under the Defense Base Realignment and Closure Act of 1995, Sudbury Annex has been identified for closure by November 1997.

1.3 SUMMARY OF PREVIOUS INVESTIGATIONS

Site investigations began in 1980 under the U.S. Department of Defense (DOD) Installation Restoration Program (IRP), to assess and address the environmental impact of past land usage. Pursuant to that mission, sites have been investigated by several organizations, as reported by ABB-ES (1995) and OHM Corporation (OHM) (January, 1994):

1980. U. S. Army Toxic and Hazardous Materials Agency (USATHAMA) (now U.S. Army Environmental Center [USAEC]) conducted a detailed record search to identify potential AOCs. Eleven areas (A1 through A11) were identified.

1983. U.S. Army Environmental Hygiene Agency (AEHA) conducted hydrogeological and subsurface investigations of the eleven sites in 1983 and concluded that the potential for contamination was sufficient to justify conducting an RI at Sudbury Annex.

1986. Dames & Moore, Inc. (D&M) conducted RIs of the eleven sites and also studied potential contamination sources in the vicinities of the Capehart Family Housing Area (CFHA) in the southern section of Sudbury Annex, Puffer Pond, and associated streams. Based on these investigations additional areas were included on the list of potential AOCs.

1985-1987. NUS, Inc. (NUS) conducted a Preliminary Assessment (PA) of Sudbury Annex in June 1985, under contract to the U.S. Environmental Protection Agency (USEPA). The PA included a review of D&M's draft Remedial Investigation/Feasibility Study (RI/FS) Report. Subsequently NUS completed a site inspection of Sudbury Annex (1987). Based on conditions associated with a release of polychlorinated biphenyls (PCBs) at area A12 (just south of A11), the USEPA placed Sudbury Annex on the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

1990. A series of interviews were conducted by the Army with employees from Natick Laboratories regarding possible disposal or dumping of chemical wastes at Sudbury Annex, and new SAs were designated on this basis (Fort Devens, 1990).

1991. D&M conducted an SI inspection of SA P48, which is the former Petroleum, Oil, and Lubricant (POL) Bladder Testing Area (POL Test Area).

1991. GZA Geoenvironmental, Inc. (GZA) conducted an SI for the U.S. Army Corps of Engineers on 100 acres of land excessed from the northernmost part of Sudbury Annex in Maynard. GZA found no evidence of disposal or DOD-related sources of environmental contamination.

1991-1992. OHM conducted Phase I SIs at 65 of 68 SAs identified at Sudbury Annex and conducted Phase I RIs at the other three SAs (OHM, January 1994) listed below:

A4 - Waste Dump
A7 - Old Gravel Pit Landfill
A9 - POL Burn Area

1992. OHM prepared a Master Environmental Plan (MEP) (OHM, 1992) for USAEC, based on records reviews and interviews conducted as part of the Phase I site investigations. Sixty-eight SAs were identified: A1 through A12 (which had been previously identified) and P1 through P56.

1993-1994. OHM conducted Phase II SIs and RIs for USAEC of the following SAs (OHM, September 1995):

Remedial investigations -

A4 - Waste Dump
A7 - Old Gravel Pit Landfill
A9 - POL Burn Area

Site Investigations -

A3/P5 - General Dump/Drum Storage Area
P4 - Bunker Drum Area
P7 - Patrol Road Waste Area
P17 - Building T206 Cloth Burial Area
P19 - Clearing, Tracked Road
P20 - Burned Drum Area
P25 - Test Chamber Building T463
P35 - Main Gate Guard Shack
P49 - Two Drums Near Road and Bunker 323
P51 - One Drum Near White Pond Road
P59 - Can Area
P60 - Patrol Road Drum

1994. E&E prepared an updated MEP for USAEC (E&E, May 1994).

1993-1994. E&E conducted Phase II RIs and SIs for USAEC of the following SAs (E&E, September 1994 and June 1995):

Remedial Investigations -

A12/P36/P37	-	PCB Spill Remediation Area/Former Raytheon Building T104/Building T106 UST
P11/P13	-	Building T405 Dump Area/ Massachusetts Fire Fighting Academy (MFFA)

Site Investigations -

A1	-	Decontaminated Mustard Area
A2	-	Demolition Ground I
A5	-	Solvent/Waste Dump
A6	-	Demolition Ground II
A8/P10	-	Food Burial Area/Confidence Course Dump Area
A10	-	Railroad Pit/Underground Storage Tank (UST) area
A11	-	Leaching Field
P1	-	UST Across from Building T223
P2	-	Building T267 Fuel Spills
P3	-	Building T209 UST
P6	-	Puffer Pond Possible Dump Area
P9	-	Stream Dump Between Sites A7 and A9
P16	-	Chemical Waste Storage Bunkers 302, 306, and 309
P22	-	Old Gravel Pit
P23	-	Building T465 Drums
P26	-	Air Drop Zone Clearing
P27	-	Pyrotechnics Test Area
P28/P38	-	Rocket Range
P31/P58	-	Old Dump/Sudbury Road Dump
P39	-	Dump Area
P40	-	Building T452 Area
P41	-	Bunker 303 Pesticide/Herbicide Storage
P42	-	Off-Site Dump

P43A/43B	-	Disturbed Area/Stained Soils and Stressed Vegetation
P45	-	Burned Area by Outside Fence
P48	-	Fuel Bladder Area
P52	-	Possible Drum Area Near Federal Emergency Management Agency (FEMA) Property
P54	-	Bunkers 305, 307, and 314
P56	-	Cleared Area South of Bunker 303
P57	-	Former Building S449

1995. ABB-ES conducted SSIs at the following SAs (ABB-ES, April 1995b and November 1995):

A3	-	General Dump
A5	-	Solvent Waste Dump
A10	-	Railroad Pit/UST Area
A11	-	Leaching Field
P5	-	Drum Storage Area
P6	-	Puffer Pond Possible Dump Area
P9	-	Stream Dump Area
P16	-	Chemical Waste Storage Bunkers 302, 306, and 309
P23	-	Pyrotechnics Test Area
P28	-	Railroad Classification Yard/Rocket Range
P38	-	Former Railroad Inspection Pit
P41	-	Bunker 303 - Pesticide/Herbicide Storage
P45	-	Burned Area Outside Fence
P54	-	Bunkers 301, 305, 307, 311, 317, and 314

Of the 74 SAs at Sudbury Annex, 35 have No Further Action (NFA) Decision Documents signed by the Army and the EPA, 5 have Proposed Plans and Records of Decision under preparation, 4 sites are scheduled for remedial actions and further investigation of the groundwater, 7 are scheduled for removal actions, 12 site investigation reports in preparation, and 11 sites require further investigation.

ABB-ES also prepared an update of the MEP current through 1994 (ABB-ES, December, 1995).

2.0 SUPPLEMENTAL SI TASKS

This section briefly describes the tasks that will be undertaken during the planned investigations. More details can be found in the POP (ABB-ES, April 1995a), which is the principal planning document and incorporates the Sampling and Analysis Plan (SAP) and the Health and Safety Plan (HASP). The SAP includes the Quality Assurance Project Plan (QAPjP) and the Field Sampling Plan (FSP).

2.1 DATA QUALITY OBJECTIVES

Levels of quality, USAEC Certification Classes, and Data Quality Objectives (DQOs) are specified in Section 3.0 of the POP.

2.2 FIELD INVESTIGATION

The SSI field investigations at the SAs and AOCs described on page 1-1 will include the tasks listed below. SA-specific investigations are discussed in Section 3.0 and are itemized in Tables 3-1 through 3-7.

- Utility clearance as appropriate at subsurface exploration locations.
- Geophysical surveys.
- Field observations.
- Surface soil sampling.
- Soil borings for subsurface soil sampling.
- Installing monitoring wells for groundwater sampling and aquifer characterization.
- Well development.

- Groundwater sampling in new and selected existing monitoring wells.
- Surface water/sediment sampling. All surface water analyses will include hardness.
- Geotechnical testing of sediment and selected soil samples.
- Water level measurements in new and selected existing monitoring wells. Slug tests in newly installed monitoring wells.
- Surveying locations and elevations of soil borings, monitoring wells, surface-soil samples, and surface water/sediment samples.
- Management of investigation-derived waste (IDW).

These tasks will be performed in accordance with the procedures set forth in Section 4.0 of the POP.

2.3 ANALYTICAL PROGRAM

The analytical program for the planned investigations is designed to identify the analytes that are expected to be encountered based on the results of previous investigations conducted at those AOCs and SAs, and it is designed to support the applicable DQOs. The specific analyses are identified in Section 3.0 and are summarized in the Sampling and Laboratory Analysis Schedule (Table 3-7).

2.4 QUALITY ASSURANCE/QUALITY CONTROL

Environmental sampling and analysis will be conducted in accordance with the requirements of the USAEC Quality Assurance (QA) program and the POP. These Quality Control (QC) procedures to be employed include the use of calibration standards and blanks for field measurements; collection of duplicate samples, equipment rinsate blanks, trip blanks, and matrix spike/matrix spike duplicates; and chain-of-custody procedures for handling and shipment of samples.

2.5 Data Management and Evaluation

Geotechnical and chemical data generated from the planned investigations will be managed in accordance with the procedures set forth in Section 8.0 of the POP. The data will be evaluated to determine whether they meet the applicable DQOs.

2.6 Contamination Assessment and Preliminary Risk Evaluation

ABB-ES will assess the presence, sources, and spatial distribution of contamination, as well as potential pathways of contaminant migration in the environment.

At the RI sites, ABB-ES will update the quantitative risk assessments.

At the SI sites, ABB-ES will perform PREs to help determine whether environmental conditions will require:

- NFA
- Removal actions
- Inclusion in a facility-wide arsenic investigation, or
- RI

The PRE is a tool used in support of decision-making during the site investigation process. It provides an evaluation of the primary exposure pathways which might be expected to contribute, in a significant way, to potential human and ecological risks associated with exposures to analytes at the site. The results of the PRE are used in conjunction with information gathered on potential sources of analytes and on analytes migration potential to focus future site remedial activities.

The PRE methodology involves comparing maximum detected analyte concentrations in each evaluated medium to human health and ecological standards, guideline values, and criteria. Analytes detected at concentrations that exceed selected risk screening values may be considered contaminants of potential concern. The PRE is designed to result in a conservative evaluation. The use of standard default exposure assumptions and evaluation of maximum analyte concentrations allows for an evaluation that should not overlook or dismiss potentially significant risks.

No state or federal standards or guidelines exist for ecological surface soil exposure. This exposure pathway will be evaluated by comparing analyte concentrations in surface soil to protective contaminant levels (PCLs) for terrestrial vertebrate receptors, phytotoxicity benchmark values for plants, and invertebrate toxicity benchmark values for terrestrial invertebrates.

For risk screening, PCLs will be compared directly to analytical data. The PCLs will be calculated using a computer-generated chronic exposure food web model. The methodology for PCL calculation has been discussed in several Fort Devens SI reports (ABB-ES, 1993). PCLs will be based on exposure to a minimum of 5 vertebrate receptors known or expected to occur at Sudbury Annex. It is likely that PCLs will include potential contaminant exposure to sensitive receptors such as the short-tailed shrew (*Blarina brevicauda*) and the American woodcock (*Scolopax minor*). The lowest PCL for each analyte will be selected for comparison to the analytical soil data.

Phytotoxicity risk screening will be conducted through a direct comparison of phytotoxicity benchmarks to detected surface soil analyte concentrations. Terrestrial phytotoxicity data will be obtained from literature reports (Suter and Will, 1994). Generally, plant benchmark values will represent significant phytotoxic endpoints, such as reduction in root weight or decrease in top weight. Because terrestrial phytotoxicity data are generally limited, a number of surrogate values may need to be used as phytotoxicity benchmark values at Sudbury Annex.

In order to assess potential effects of surface soil contaminants on terrestrial invertebrates (e.g., earthworms), toxicity data for earthworms will be obtained from the literature. Earthworm toxicity risk screening will be conducted via a direct comparison of the analytical data to earthworm toxicity benchmarks. In general, toxicity data for reproductive effects will be chosen as benchmarks. When reproductive data were unavailable, appropriate mortality endpoints will be chosen as benchmarks.

Background concentrations of analytes at Sudbury Annex are presented in Tables 2-1 through 2-2. The risk screening values that will be used to evaluate the SSI results are presented in Tables 2-3 through 2-5.

2.7 REPORTS

The results of the SSIs will be presented in SSI Data Packages and in a draft, draft final, and final SSI Report.

The results of the RIs will be incorporated in Technical Memoranda.

2.7.1 Supplemental Site Investigation Data Packages

SSI Data Packages will be prepared after completion of the field effort, laboratory analysis, data evaluation, and PREs. The Data Packages will present tabulations and summaries of the results of the SSI field investigations and laboratory analyses. Included also will be maps of the SAs showing sampling locations and associated analyte concentrations.

2.7.2 Supplemental Site Investigation Report

The SSI Report will be prepared after completion of the SSI Data Packages. It will include all field data, laboratory data, and other relevant data acquired during Phase I and Phase II SIs and the SSIs. It will be prepared in accordance with USAEC requirements and applicable USEPA guidance. PREs will be included in the SSI reports.

2.7.3 Technical Memoranda

Technical memoranda will be prepared after completion of the RI data gap field effort, laboratory analysis, and data evaluation at AOCs A4 and A7/A9. Each memorandum will present a brief discussion of results of the investigation, and will include a map showing new explorations, a tabulation of analytical results, and an evaluation of data collected during the RI data gap investigation. The memoranda will include comparison of analytical results from the new explorations with the previously calculated risk assessments, but will not include risk assessments based on RI data gap sampling.

3.0 SCOPE OF INVESTIGATIONS

The plans presented herein are based on the findings and recommendations of previous investigations. Evaluations of site conditions in previous SI phases (OHM, January 1994; E&E, September 1994) were based on comparisons of detected analyte concentrations with background concentrations observed at Sudbury Annex and with screening levels (readily available risk-based standards and guidelines). The principal analytes of concern identified at some of the sites were arsenic and lead: the background concentrations and specific screening levels for these and other analytes are presented in Tables 2-1 through 2-5 (refer also to E&E, September 1994, Tables 6-1, 6-2, and 7-1 through 7-7; OHM, January 1994, Tables 8-7 and 8-8).

Summaries of the relevant history of each SA or AOC are provided in the following subsections, and include descriptions of the scope of previous investigations, what these investigations have revealed about environmental contamination, and the supplemental investigations that are planned to obtain necessary additional data.

3.1 AREA OF CONTAMINATION A4 - WASTE DUMP

AOC A4, one of the original potential AOCs identified at Sudbury Annex by the Army, was identified by a Natick Laboratory employee during a record search (USATHAMA, 1980). This area, used for encampments during training exercises, was reportedly used for 3 or 4 years during the late 1960s and early 1970s for the burial of unidentified chemical wastes. Information regarding the types or quantities of wastes buried is not available. Based on the record search interview, it was concluded that drums may have been buried in an area near the East Gate. Small amounts of construction debris, including road pavement material from parts of installation roadways, have reportedly been dumped at this location since 1986. Three monitoring wells (EAHA7, DM4, and DM5) were installed during previous investigations by AEHA and D&M. Additionally, three sets of surface water and sediment samples (SW2/SD2, SW5/SD5, and SW11/SD11) were collected by D&M. A Phase I and Phase II RIs were conducted by OHM (January 1994 and September 1995).

3.1.1 Site Description and Previous Findings

AOC A4 is located on the northern portion of the Annex adjacent to the East Gate (Figure 3-1). The area consists of a clearing, approximately 1,000 feet long by 200 feet wide which parallels the north side of Old Marlboro Road/Craven Lane. The clearing is bordered by woods and a small stream, which flows along the northwestern side of the site and empties into the wetland located to the southwest. The area includes a surface dump in a depression located at the southwest end of the site and an old building foundation and stone wall at the northeast end of the site. The building foundation has been identified as the Rice Tavern or Vose Farm and is potentially of historical significance.

In 1984, D&M determined that there was no indication of a source of contamination at Area A4 but that additional investigations were warranted. In the Phase I RI, OHM performed geophysical surveys in an attempt to detect buried objects and locate burial areas; no unusual anomalies or evidence of drum disposal were found. Additional explorations included excavation of three test pits, collection of four surface soil samples, drilling of two soil borings, installation of two monitoring wells, and the collection of three surface water and sediment samples (OHM, January 1994). Samples collected were analyzed for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs), pesticides/PCBs, chlorinated herbicides, metals, and explosives. Previous detections of lead in groundwater from monitoring well OHM-A4-5 were not confirmed by resampling conducted during this investigation. In test pit A4TCP, located near well OHM-A4-5, a soil lead concentration of 570 milligrams per kilogram (mg/kg) was detected. This sample was collected at the top of undisturbed soil approximately 4 feet below the top of the excavation.

The Phase II investigation consisted of a tank removal from the basement of the Rice Tavern, surface soil sampling, test pitting and sampling, monitoring well installation and groundwater sampling, and surface water and sediment sampling. A soil sample from beneath the galvanized tank in the tavern basement had a lead concentration of 520 micrograms per gram (μg/g) (890 μg/g in the duplicate sample), zinc at 2,550 μg/g, and chrysene at 0.91 μg/g. Other contaminants detected in soil at concentrations in excess of Massachusetts Contingency Plan (MCP; 310 CMR 40) S-1/GW-3 soil standards were arsenic, beryllium, zinc, and chrysene. The arsenic and beryllium concentrations at the site are interpreted to represent background levels for Sudbury Annex, and zinc and chrysene were

detected only in samples taken from beneath the former galvanized tank location. Area A4 surface water and sediment samples also contained compounds at concentrations in excess of applicable standards. Lead, chromium, copper, and dichlorodiphenyltrichloroethane (DDT) at concentrations above Federal Water Quality Standards were detected in surface waters. The maximum detected concentrations of aluminum, chromium, copper, and lead were in sample A4SW5. Due to a lack of standing water at the surface water sampling locations, surface water samples were collected from shallow sumps excavated into the sediments. The method of collection resulted in a greater quantity of suspended solids in the samples than would be expected for undisturbed surface water samples. Concentrations of metals detected in the surface water samples are consistent with the concentration detected in the sediment samples, suggesting that the water samples were affected by suspended sediments, and are not representative of actual surface water conditions (OHM, September 1995). Several metals, three VOCs, dichlorodiphenyldichloroethane (DDD), and dichlorodiphenyldichloroethylene (DDE) were detected in sediment samples at concentrations above Phase I background soil (95-percent upper confidence limit) values.

3.1.2 Planned Data-Gap Investigation

The planned investigations include the collection of additional surface water samples. The plans and rationale for the investigations at AOC A4 are presented in Tables 3-1 and 3-7. The proposed sample locations are shown on Figure 3-1.

Surface-water samples from three locations (JO-A04-D20 to JO-A04-D22) will be collected and analyzed by an off-site laboratory for lead and hardness. Sample JO-A04-D21 will be collected at former sample location 4ASW5. The remaining two surface water samples will be collected approximately 75 feet east and west of location 4ASW5. If standing water is not present at the designated sample locations, no surface water samples will be collected at this AOC.

3.2 AREAS OF CONTAMINATION A7/A9 MANAGEMENT-OF-MIGRATION OPERABLE UNIT

AOCs A7 and A9 are proximate sites between Patrol Road and the Assabet River, in the northwestern part of Sudbury Annex. Based on the results of the RI/FS (OHM, 1995a), they have been combined into a single OU for Management of Migration.

3.2.1 Site Histories

Although AOCs A7 and A9 are located near each other in areas of similar hydrogeologic conditions, the sites have had distinctly different histories since acquisition by the Army at the beginning of World War II.

3.2.1.1 History of Area of Contamination A7. AOC A7, the Old Gravel Pit Landfill, is a 10-acre site located northeast of the U.S. Air Force (USAF) Radar Station. The general area apparently was used as a source for gravel during the initial construction of the Ammunition Depot in 1942. In general, the site is topographically level, but slopes steeply down to Track Road and the Assabet River on the northern side and to a small stream and wetland terrain on the northeastern side.

AOC A7 was used as a general refuse and laboratory dump between the late 1950s and mid 1970s; reportedly the disposed waste included drums and other chemical containers. In interviews with Natick Laboratory employees who participated in chemical disposal activities in the early to mid-1970s, the employees indicated that quart to gallon-sized metal and glass containers of chemicals were disposed of in this area on a weekly basis. Occasionally, a house cleaning would take place at the laboratory, and excess chemicals and waste temporarily stored in a bunker would also be disposed of, possibly in this area. The areas most likely to have been used for chemical disposal were on both sides of the access road as it enters the main cleared area. Reportedly, general refuse was buried at shallow depths, and burning was used as a volume control measure. Unauthorized refuse disposal occurred during the 1970s until site access was restricted by a fence.

A possible transformer site, originally called Area P8, is located in a wooded section at the east end of A7. Area P8 is now considered to be a part of Area A7 and is no longer treated as a separate site.

3.2.1.2 History of Area of Contamination A9. AOC A9 (the POL Burn Area) is an 8-acre site located approximately 700 feet northeast of AOC A7, and it is separated from AOC A7 by a stream that discharges to the Assabet River. The land is generally level and open. Beyond the site, the land slopes down to the stream to the southwest and also down to the Assabet River to the northwest. AOC A9 was historically used for flame-testing of fire retardants on clothing (until around 1986); testing or storage of POL; training by the Massachusetts Fire Fighting Academy (from 1970 through 1984); and destruction of confiscated fireworks by the Massachusetts State Police (from the early or mid-1970s to 1991). AOC A9 now includes the site of an abandoned 1,000-gallon UST site, located southeast of well OHM-A9-54, previously designated Study Area P12. The tank at P12 contained JP-4 fuel that apparently was used for the clothing testing. The tank was located beneath a metal shed on the northeast side of the site and was removed in May 1992.

In 1986, the Massachusetts Department of Environmental Protection (MADEP) visited the site and observed standing oil in a concrete trench, oil in surface soils over a wide area, and numerous stored drums with unknown contents. A Fort Devens contractor removed all drums and above-ground tanks in 1986. In 1987 and 1988, approximately 1,100 cubic yards of soil were removed and disposed of under manifest by Zecco, Inc.

3.2.2 Site Descriptions and Previous Findings

The scope and findings of environmental investigations at AOCs A7 and A9 are summarized in the following subsections.

3.2.2.1 Descriptions and Findings at Area of Contamination A7. Initial investigations at Study Area A7 included the installation and sampling of monitoring well EHA2 by AEHA in 1983, and the installation and sampling of monitoring well DM12 and the collection of one surface water and one sediment sample by D&M in 1985. Well DM12 reportedly contained high concentrations of plasticizers (up to 1,000 micrograms per liter [μg/L]). The plasticizers could have

been attributable to the use of plastic in sampling, but possibly suggested groundwater contamination.

OHM performed a Phase I RI in 1991 and 1992 that included the installation of test pits, surface soil sampling, soil borings and subsurface soil sampling, monitoring well installation and groundwater sampling, and surface water and sediment sampling. Most of the samples were analyzed for Target Compound List (TCL) VOCs and TCL SVOCs, TCL pesticides/PCBs, Target Analyte List (TAL) metals, explosives, and chlorinated herbicides. Drums, construction debris, and laboratory debris were discovered in the subsurface explorations of the site. Metal contamination was present at several exploration locations and included mercury (0.919 μg/g from boring OHM-A7-8), and lead (160 μg/g from test pit A7TPK). Organic compounds including pesticides, PCBs, polycyclic aromatic hydrocarbons (PAHs), chlorinated solvents, fatty acids, and various hydrocarbons potentially related to the release of gasoline or oil were detected.

During the Phase I RI, eight overburden wells and one bedrock well were installed.

Overburden wells:	OHM-A7-7
	OHM-A7-8
	OHM-A7-9
	OHM-A7-10
	OHM-A7-12
	OHM-A7-13
	OHM-A7-45
	OHM-A7-46
Bedrock well:	OHM-A7-11

The existing two wells on site, EHA2 and DM12, were abandoned. Metals were detected in groundwater. Tetrachloroethylene (PCE) was detected at monitoring wells OHM-A7-8 and OHM-A7-46, located near test pit A7TPK. Chloroform and chlorobenzene were also detected in groundwater samples collected from OHM-A7-8. These contaminants were not detected in groundwater samples collected from the boundary wells OHM-A7-9 through OHM-A7-12. Pesticides were detected in wells OHM-A7-45, OHM-A7-46, and OHM-A7-8, but not in wells located along the site boundary.

The Phase II RI, conducted by OHM in 1993, included the installation of monitoring wells with subsurface soil sampling, surface water/sediment sampling, hand auger sampling, test pit excavations with subsurface soil sampling, soil sampling from borings, and groundwater sampling.

Concentrations of beryllium (0.406 μg/g) and lead (up to 3,900 μg/g in A7TPR) in test pit soils exceeded screening levels used by OHM. DDT, DDD, and DDE were also detected in test pit soils at concentrations in excess of soil standards.

During the Phase II RI, two shallow monitoring wells, designated OHM-A7-51 and OHM-A7-52, were installed along the fence north of the test pit A7TPR. These two wells along with OHM-A7-8, OHM-A7-45, and OHM-A7-46 were sampled to determine if pesticides and chlorinated VOCs previously detected were still present at or migrating from the site. In monitoring well OHM-A7-8, lindane (0.49 μg/L) and four VOCs (1,1,2-TCA, carbon tetrachloride, chloroform, and PCE) exceeded Federal Maximum Contaminant Levels (MCLs). Monitoring well OHM-A7-51 also had detections of chloroform (120 μg/L), PCE (130 μg/L), and TCE (50 μg/L) at concentrations in excess of drinking water standards. Lindane was also detected in OHM-A7-51 both the filtered (3.6 μg/L) and unfiltered (3.5 μg/L) samples at concentrations greater than the MCL of 0.2 μg/L.

Filtered and non-filtered samples were collected from previously sampled wells (OHM-A7-45 and OHM-A7-46) to determine if pesticides were present as suspended or dissolved constituents. Only OHM-A7-46 had detectable concentrations of lindane in the unfiltered (3.1 μg/L) and filtered samples (2.8 μg/L).

3.2.2.2 Descriptions and Findings at Area of Contamination A9. D&M installed three monitoring wells in the area of AOC A9 in 1984, as part of a pre-CERCLA RI. Sampling indicated the presence of chlorinated solvents. Groundwater samples were also collected from those wells in 1987 and 1988 by Zecco, as part of a clean-up of petroleum-contaminated soil. The samples were analyzed for VOCs, metals, and oil and grease. The chlorinated solvents 1,1,1-trichloroethane, 1,1-dichloroethene, and carbon tetrachloride were detected in downgradient water-table well DM8, and 1,1,1-trichloroethane was also detected in water-table well DM10. Fuel oil and the petroleum hydrocarbons toluene, ethylbenzene, and xylene were detected in downgradient water-table well DM9A.

The 1987-1988 soil removal (approximately 1,100 cubic yards) by Zecco reached a depth of 26 feet in one location. The excavations were backfilled with fill from an unknown location at Sudbury Annex.

OHM conducted CERCLA RIs in 1991-1992 and 1993. Sampling included surface and subsurface soils and groundwater. The pesticides, DDT, and DDE, arsenic, and several PAHs were detected in surface soil. In subsurface soil, petroleum-related VOCs and PAHs were detected, and 1,1,1-trichloroethane was detected in the fill area. Groundwater was found to contain chlorinated solvents, petroleum-related VOCs and SVOCs, pesticides, or explosives. These results confirmed the presence of what were identified as the "chlorinated VOC" groundwater plume (extending from the south quadrant of the site northwestward toward the Assabet River) and the "xylenes" groundwater plume (extending from the northern quadrant of the site northwestward toward the Assabet River). The sampling results indicated that the upgradient origin of the VOC plume is in the vicinity of well OHM-A9-55.

Free-phase chlorinated solvents were not encountered in any of the subsurface borings or wells, and detected concentrations of those compounds in groundwater were orders of magnitude below their respective solubilities. The inferred dip of the soil/bedrock interface and the thin overlying till layer at AOC A9 is generally northward across the site. Under that interpretation, monitoring well OHM-A9-18 is located down-dip from the inferred source area for the chlorinated solvents. If there were a dense immiscible phase of chlorinated solvents at the site moving along the top of till or the top of rock, it would be expected to move down-dip in the general direction of well OHM-A9-18. Well OHM-A9-18 was screened below the water table at the top of the till layer but because of siltation, it proved to be unsamplable, and the presence or absence of free-phase product could not be determined in that well.

3.2.3 Planned Data-Gap Investigations

Data-gap investigations proposed at AOCs A7 and A9 are described in the following subsections.

3.2.3.1 Planned Investigations at AOC A7. The planned data-gap investigations are directed at assessing off-site groundwater quality downgradient of AOC A7. The investigation will include: installing four monitoring wells outside the facility

boundary downgradient of the identified contaminant plume; sampling and analyzing groundwater from the new wells and selected existing wells; and collecting additional water-level data. Slug tests will be performed in the new wells to characterize aquifer properties. Summaries and rationale for the planned investigation are presented in Tables 3-2, 3-3, and 3-7. Figure 3-2 shows the locations of planned and existing monitoring wells.

An elevation survey will be conducted to provide control for measuring the water-level of the Assabet River near the new wells, and will include the new monitoring wells and selected existing monitoring wells as needed. One round of water-level elevation measurements will be collected from all of the AOC A7 monitoring wells.

Four monitoring wells will be installed between the facility boundary and the Assabet River, at locations downgradient of monitoring wells OHM-A7-52, OHM-A7-51, and OHM-A7-9 (Figure 3-2). Three of the wells (JO-A07-M61, JO-A07-M62, and JO-A07-M63) will be screened at the water table to assess water quality and hydraulic gradients. It is anticipated that the water table in this general area is quite shallow, and consequently it may not be possible to construct the wells in strict compliance with the requirements of the POP (ABB-ES, April 1995a, pp. 4-18 - 4-21). Specifically, it may not be possible to extend the filter pack sand to a level 5 feet above the top of the well screen or to include a 5-foot bentonite seal. These well components will be reduced in length as necessary to accommodate the conditions encountered in the field. The fourth monitoring well (JO-A07-M64) will be installed at a location approximately 10 feet from well JO-A07-M63. It will be screened at the top of rock or at 50 feet below ground surface (bgs), whichever is shallower. This well will provide a location for determining water quality at depth, and may be in an area of an upward hydraulic gradient. By pairing it with a water-table well, it may be possible (depending on the vertical separation of the well screens) to verify and measure the vertical gradient.

Two rounds of groundwater samples will be collected from the four new monitoring wells and from existing wells OHM-A7-8, OHM-A7-9, OHM-A7-10, OHM-A7-12, OHM-A7-51, and OHM-A7-52. The samples will be analyzed for Project Analyte List (PAL) VOCs and pesticides. After receipt of satisfactory analytical results for the groundwater samples, the newly installed off-site

monitoring wells will be decommissioned, and the pre-drilling ground surface at those locations will be restored.

3.2.3.2 Planned Investigations at AOC A9. The planned data-gap investigations at AOC A9 will be directed at assessing whether or not chlorinated solvents in the form of a dense nonaqueous-phase liquid (DNAPL) may have migrated down-dip on top of the dense till layer or on top of rock. Summaries and rationale for the planned investigation are presented in Tables 3-2, 3-3, and 3-7. Figure 3-3 shows the locations of planned and existing monitoring wells.

One soil boring (JO-A09-B60) will be drilled to the top of bedrock at a location approximately mid-way between monitoring well OHM-A9-18 and well OHM-A9-55, the inferred source area for chlorinated solvents. It is estimated that bedrock is approximately 65 feet deep at that location. Split-spoon samples will be collected at 10-foot intervals from ground surface to 40 feet bgs and at 5-foot intervals from 40 feet bgs to total depth. The samples from 40 feet bgs and deeper will be analyzed overnight for chlorinated solvents by gas chromatograph (at Data Quality Level II), in ABB-ES' Wakefield, Massachusetts Treatability Laboratory. If those results indicate the presence of chlorinated VOCs in the soil at concentrations exceeding screening levels, boring JO-A09-B60 will be converted to monitoring well JO-A09-M60. The well will be screened at the depth of the highest concentration of chlorinated VOCs, and the borehole will be grouted back to the bottom of the well-screen interval before installing the well. If no chlorinated VOCs are detected in the soil, then the borehole will be grouted and no well will be installed.

Two soil samples will be selected for confirmatory off-site analysis (at Data Quality Level III) for PAL VOCs. For a situation where chlorinated VOCs are detected in the Level II analyses, one of the confirmatory samples will be from the screened interval (and will be analyzed also for Total Organic Carbon [TOC]), and the other sample will be either from the interval with the second highest Level II concentrations or (if chlorinated VOCs are not detected in any other interval) from the interval immediately above the well screen. For a situation where no chlorinated VOCs are detected in the Level II analyses, then the confirmatory samples will be from the two deepest sampled depths.

If a well is installed, a sump will be built into the well and the presence of DNAPL will be verified by use of an interface probe. If there appears to be

sufficient thickness of DNAPL, an attempt will be made to collect some directly by use of a pump. One groundwater sample will be collected and will be analyzed at Data Quality Level III for PAL VOCs.

One round of groundwater samples will be collected from existing monitoring wells OHM-A9-17, OHM-A9-55, OHM-A9-56, and OHM-A9-58 and will be analyzed at Data Quality Level III for PAL VOCs.

An elevation survey will include the new monitoring well and selected existing monitoring wells as needed. A slug test will be performed in the new well to characterize aquifer properties unless the presence of DNAPL is determined to interfere with the test.

3.3 STUDY AREA P1 - UST ACROSS FROM BUILDING T223

Study Area P1 was identified in a 1990 Fort Devens memo as an abandoned 1,000-gallon UST across Patrol Road from Building T223. The tank was used for gasoline storage, and appears to have been associated with former Building T202. A building known to have been demolished in 1961 is most likely Building T202. In the 1950s and 1960s, Building T202 was a fire station and motor pool. It later served as a maintenance garage. The Phase I SI was conducted by OHM (January 1994), and the Phase II SI was conducted by E&E (September 1994).

3.3.1 Site Description and Previous Findings

SA P1 is located on the south side of Patrol Road, approximately 1,800 feet northeast of the main gate (Figure 3-4). The area is grass covered, and an asphalt pad covers the former UST location. The site is located at the base of a hill near a wetland associated with Willis Pond.

A geophysical survey was conducted during the Phase I investigation to locate the UST. The tank and associated piping were subsequently removed by ATEC Environmental Consultants (ATEC) in 1992. Both the tank and piping were severely corroded. Additionally, approximately 150 tons of contaminated soil were removed. ATEC installed three monitoring wells (MW1, MW2, and MW3) to assess groundwater quality. Analytical results of samples collected from these

wells did not indicate the presence of total petroleum hydrocarbons (TPHC) in groundwater.

During the Phase II SI, E&E (September 1994) drilled three soil borings downgradient of the tank excavation and analyzed soil samples for organics, SVOCs, metals, and TPHC. Arsenic (150 μg/g detected in E3-P1-B05 at a depth of 4 to 6 feet bgs was found at a concentration five times the screening values for soils in both residential (GW-1/S-1) and industrial (GW-3/S-3) exposure scenarios. Beryllium concentrations (maximum 0.506 μg/g) were slightly higher than the screening level (0.4 μg/g) in all three samples; E&E concluded that these are probably naturally occurring concentrations.

E&E sampled groundwater from ATEC monitoring well MW-3 in September 1993 (unfiltered sample) and in April 1994 (filtered and unfiltered samples). In both of the unfiltered samples, the concentrations of several metals exceeded screening levels. In the filtered sample, however, no analytes exceeded screening levels.

3.3.2 Planned Supplemental Investigation

No supplemental investigations are planned for SA P1. A PRE will be conducted on all contaminants detected at SA P1 using the existing data from the SA.

3.4 STUDY AREA P4 - BUNKER DRUM AREA

SA P4 was identified in a Fort Devens memo as an area containing four upright 55-gallon drums that were discovered between Bunkers 347 and 349. An additional 55-gallon drum was found in an area west of the original four drums. The Phase I and Phase II SIs were conducted by OHM and E&E.

3.4.1 Site Description and Previous Findings

SA P4 is located in the central area of the Annex, south of Honey Brook along a bunker access road between Bunkers 347 and 349 (Figure 3-5). The area is vegetated by a moderately dense forest, and slopes slightly downward from south to north. The four drums were originally found on the south side of the access road strapped in a harness. The drums were probably dropped by parachute

during tests conducted at Area P26 the Taylor Drop Zone. The drop zone is approximately 500 to 700 feet west of SA P4. These four drums were empty, when discovered, but may have contained water when dropped. One of the four drums was marked "poison". An additional 55-gallon drum was found north of the access road during the Phase I SI.

The Phase I investigation consisted of a site reconnaissance, surface water and sediment sampling, removal of the five 55-gallon drums, and confirmatory soil sampling at each drum location. The OHM narrative and site figure for this area are inconsistent. In the technical approach section of the OHM report, soil sample P4CD1 is described as being collected at the location of the four drums west of Bunker 349 and south of the access road; however, the figure shows P4CD1 on the northside of the road. Sample P4CD2 was collected from beneath the former location of the single drum north of the access road.

Results of the soil sample P4CD1 indicated concentrations of arsenic at 200 μg/g, antimony at 2.89 μg/g, cadmium at 1.66 μg/g, and lead at 48 μg/g. Also detected were DDT, DDD, DDE, and beta-endosulfan at elevated levels, as well as several PAHs.

The OHM Phase II investigation (OHM, September 1994) consisted of collecting four surface soil samples (P4SO1B through P4SO4B) from around drum sample location P4CD1. These four samples were analyzed for SVOCs, pesticides/PCBs, and metals. Arsenic was detected in two of the four confirmatory samples (P4S03B and P4S04B) and PAHs (six out of 13 PAHs were above S-1/GW-3 soil standards) were detected in one of the four samples (P4S04C) at concentration exceeding screening levels.

3.4.2 Planned Supplemental Investigation

No supplemental investigations are planned for SA P4. A Preliminary Risk Evaluation (PRE) will be conducted on all contaminants detected at the SA using the existing data for SA P4.

3.5 STUDY AREA P17 - BUILDING T206 CLOTH BURIAL AREA

Study Area P17 is reportedly a location of clothes and other personnel combat gear burial during the 1960s and early 1970s. There is no record of disposal of contaminated materials or chemicals. Truckloads of clothes and gear were reportedly buried in shallow depressions (2 to 3 feet deep) and covered with soil. The buried materials were from Natick Laboratories research involving new products and battle-damage assessments of equipment used by troops in Vietnam. The site was originally identified as Location 19 by USATHAMA (1980).

3.5.1 Site Description and Previous Findings

SA P17 is located near SA P1, at the southeastern boundary of the northern section of Sudbury Annex, approximately 1,600 feet north of the Main Gate (Figures 3-6). SA P17 is outside the installation fence, on land excised by the Army in 1976 and now owned by the Commonwealth of Massachusetts. Throughout the 1970s the area consisted of open fields and orchards. It is at the base of a hill near a wetland associated with Willis Pond.

In the Phase I SI, OHM conducted geophysical surveys to locate possible burial sites (OHM, January 1994). Ten test pits were dug at the geophysical anomalies to investigate the presence and nature of buried materials, and to collect analytical soil samples. In six of the test pits, buried debris or evidence of contamination was not found. In the other four test pits, various types of debris, including cloth, were found at depths of 3 feet or less. Soil samples were field screened for the presence of mustard agent; mustard agent was non-detectable in all samples. The test pit soil samples were analyzed for VOCs, SVOCs, pesticides/PCBs, metals, explosives, chlorinated herbicides, phosphate, and thiodiglycol (mustard agent). Analyte concentrations did not exceed the screening levels established by E&E (September 1994, Section 7).

A drum was found and removed from the western edge of the study area, and a confirmatory soil sample (P17CD1) was collected and analyzed for the same analytes as the test pit soil samples. Arsenic (220 μg/g) was detected above the screening level established by E&E (September 1994, Table 7-2). Lead, and the pesticides DDT, DDD, and DDE were detected at concentrations above the surface-soil background levels (OHM, January 1994, Table 8-8), but those analytes did not exceed screening levels (E&E, September 1994).

OHM installed and sampled background monitoring well OHM-BW-3. No evidence of groundwater contamination was detected in samples collected from this well.

In the Phase II SI, OHM collected four surface-soil samples (P17S01 through P17S04) in a grid around the drum-confirmatory sample location (OHM, September 1995). The samples were analyzed for metals and pesticides. Arsenic was detected in four samples at concentrations ranging from 240 to 260 μg/g. These concentrations are greater than the arsenic concentration detected in the original Phase I drum-confirmatory sample (220 μg/g). Beryllium concentrations (0.44 to 0.58 μg/g) were slightly greater than the screening level of 0.4 μg/g (E&E, September 1994, Table 7-2), but OHM concluded that the concentrations are representative of background concentrations which range from 0.28 to 0.64 μg/g (OHM, September 1994). Concentrations of the pesticides DDT, DDD, and DDE were below screening levels.

3.5.2 Planned Supplemental Investigation

No supplemental investigations are planned for SA P17. A PRE will be conducted on all contaminants detected at the SA using the existing data for SA P17.

3.6 STUDY AREA P20 - BURNED AREA AND DRUM

SA P20 was identified by the USEPA in the Installation Assessment conducted on Natick Laboratories and the Sudbury Training Annex (USEPA, 1982). The site is described as a small burned area with blackened ground and some potentially stressed trees. The Phase I and Phase II SIs were conducted by OHM (January 1994 and September 1995).

3.6.1 Site Description and Previous Findings

This site is located north of Puffer Road approximately one-half mile from the North Gate (Figure 3-7). The area is a depression within the hillside adjacent to the road, and was probably used as a borrow pit. During a site reconnaissance conducted in March 1991, an empty drum was noted lying on the side of the hill with standing water in the bottom of the depression.

The Phase I investigation consisted of an area reconnaissance, surface soil sampling, removal of the empty 55-gallon drum, and confirmatory sampling at the drum location (OHM, January 1994). Two soil samples, P20CD1 collected following the drum removal and surface soil sample P20S01 collected from the bottom of the depression, downgradient of the former drum location, were analyzed for VOCs and SVOCs, pesticides/PCBs, metals, and explosives. A lead concentration of 780 µg/g was detected in the P20S01 soil sample.

The Phase II SI included a geophysical survey, excavation of two test pits, and the collection of four surface soil samples (OHM, September 1995). The surface soil samples, designated as P20S02 through P20S05, were collected around the original soil sample P20CD1 and analyzed for metals in order to assess the distribution of lead. Lead, the primary contaminant of concern for this site, was detected in sample P20S03 at a concentration of 3,000 µg/g which is 10 times greater than the MCP standard.

3.6.2 Planned Supplemental Investigation

Additional surface soil and subsurface soil sampling is planned for the SSI of SA P20. The planned samples will be collected to characterize the distribution of lead at SA P20. The plans and rationale for the SSI program are presented in Tables 3-4, 3-5, and 3-7. The area of the planned sampling is shown on Figure 3-7.

Twelve surface soil samples, JO-P20-S10 to JO-P20-S21, will be collected from a grid centered on the previous surface soil locations. A single soil boring (JO-P20-B01) will be advanced at the location of sample P20S03. Two subsurface soil samples will be collected. The samples will be collected from depths of 4 to 6 feet bgs, and 6 to 8 feet bgs. All surface soil samples and both subsurface soil samples will be submitted to an off-site laboratory for lead analysis.

3.7 STUDY AREA P22 - OLD GRAVEL PIT

This SA is described as a former gravel pit that has been used continuously since the 1940s, and which has been a depository of household and general refuse. The site was originally identified by USEPA in 1992, and was discovered through a review of aerial photographs. This site was not among those identified by Natick

Laboratory employees as one of the possible chemical disposal areas. More recently, the site has shown signs of use for off-road motorcycle riding, target practice, and the dumping of household-type refuse. The Phase I SI was conducted by OHM and the Phase II SI was conducted by E&E (OHM, January 1994; and E&E, September 1994).

3.7.1 Site Description and Previous Finding

The site is located on the western part of the Annex and is accessed through a gate via an unpaved road leading west from Patrol Road (Figure 3-8). The dirt road appears to be a popular spot for off-road motorcycle riding; the dirt road provides access to the site from a residential area west of the Annex. SA P22 is located adjacent to the unpaved road approximately 1,700 feet west of the intersection of the unpaved road and Patrol Road. Metal debris strewn about the excavation includes vacuum cleaners, tires, metal cans, and cables. A drum located near the center of the pit appears to have been used for target practice.

During the Phase I SI, four soil samples (P22S01 through P22S04) were collected by OHM and analyzed for VOCs and SVOCs, pesticides/PCBs, metals, and explosives. Only one explosive, nitroglycerin at 2.86 μg/g was found in P22S03. Nineteen metals were detected in surface soils at the site. The maximum concentrations for aluminum (28,000 μg/g), arsenic (27 μg/g), and chromium (30.3 μg/g) were detected in sample P22S02. The maximum concentration of lead (180 μg/g) was detected in sample P22S04. None of the metals concentrations exceeded their respective screening levels. A total of nine known PAHs were detected in sample P22S01B (a resample of P22S01). These included anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, phenanthrene, fluoranthene, pyrene, and indeno(1,2,3-c,d)pyrene. The greatest PAH concentration was reported for benzo(a)pyrene at 6 μg/g. No known PAHs were detected in the other three soil samples.

During the Phase II sampling effort, E&E installed one monitoring well (E3-P22-M01), collected two subsurface soil samples, collected surface soil samples at four locations (SX22-01 through SX22-04), and performed a magnetometer survey across the gravel pit (E&E, September 1994). Samples collected were analyzed for organics, metals, and explosives. A surface soil sample and a subsurface soil sample were analyzed for TOC and for grain size. Groundwater sampling did not identify any impact of site activities on groundwater. Of the four surface soil

samples collected, two samples (E3-P22-S02 and E3-P22-S03) had PAH concentrations greater than soil screening values.

3.7.2 Planned Supplemental Investigation

Supplemental investigations at SA P22 are intended to further characterize the distribution of SVOCs. The plans and rationale for the SSI program at SA P22 are presented in Tables 3-4 and 3-7. The area of the planned sampling is shown on Figure 3-8.

Four surface soil samples, JO-P22-S10 to JO-P22-S13, will be collected from a grid centered on the location of sample P22S01. The individual sampling locations will be approximately ten feet from the location of sample P22S01. All four samples will be submitted to an off-site laboratory for PAL SVOC analysis.

A PRE will be conducted on all contaminants detected at the SA using the existing data for SA P22 and data to be collected during the SSI.

3.8 STUDY AREA P35 - MAIN GATE GUARD SHACK

Area P35, Main Gate Guard Shack, was identified by OHM (Figure 3-9). During the initial site reconnaissance, several transformers, which may have contained PCBs, were found inside the electrical utility room attached to the Guard Shack. Additionally, a section of grass behind the building showed signs of staining and stressed vegetation. Both the Phase I and Phase II site investigations were conducted by OHM (January 1994 and September 1995).

3.8.1 Site Description and Previous Findings

The Phase I SI consisted of an area reconnaissance, the collection of one surface soil sample, the collection of four remote control oil switches and three electrical transformer oil samples (which were all analyzed for PCBs), and one groundwater sample from the Guard House water supply well located just to the south of the building. The soil sample (P35S01) and groundwater sample were analyzed for volatile and semivolatile organic compounds, pesticides/PCBs, metals, and explosives. The groundwater sample was also analyzed for phosphate. No

contaminants were detected in the groundwater sample. Results for the soil sample indicate concentrations of lead (130 µg/g), mercury (0.415 µg/g), and zinc (93.2 µg/g), all at concentrations below their respective screening levels. The pesticides DDT (3.4 µg/g), DDD (0.88 µg/g), DDE (0.49 µg/g), endrin (0.047 µg/g), heptachlor epoxide (0.038 µg/g), alpha-chlordane (0.109 µg/g), and gamma-chlordane (0.16 µg/g) were also detected. The SVOC 2-methylnaphthalene was present at 2 µg/g, and traces of methylene chloride were detected. PCB 1260 was detected in one transformer sample (P35TF1A) at a concentration of 6.1 µg/g. The surrounding samples (P35TF2-7) were nondetect for PCBs.

During the Phase II sampling effort, four surface soil samples (P35S02 through P35S05) were collected in a grid established around surface soil sample location P35S01. The samples were analyzed for metals, pesticides/PCBs, and organ phosphate pesticides to assess the distribution of pesticides, mercury, and lead, all of which were detected in the Phase I sample. Arsenic, beryllium, lead, DDD, DDE, and chlordane were detected at concentrations greater than the screening levels used by OHMMCP.

Reevaluation of the findings indicate that exceedances of S-1/GW-1 standards for pesticides were limited to three samples adjacent to Building T200, and most of the detections (P35S01, P35S02, and P35S04) were in sample B35S02. One exceedance of the S-1/GW-1 standard for arsenic (30 µg/g) was detected in sample P35S03 (32 µg/g) and one exceedance of the S-1/GW-1 standard for lead (300 µg/g) was detected in sample P35S02 (360 µg/g). No other metals exceed their respective S-1/GW-1 standards.

3.8.2 Planned Supplemental Investigation

No supplemental investigations are planned for SA P35. A PRE will be performed using the existing data for SA P35.

3.9 Study Area P59 - Can Area

Five-gallon cans and other metallic debris were discovered by facility personnel in a swampy area adjacent to Taylor Brook, north of Bunker 319. SA P59 was

investigated by OHM (September 1995) during the Phase II SI as one of two facility-wide sampling locations (along with SA 60).

3.9.1 Site Description and Previous Findings

Study area P59 is located in a lowland area in the north of Sudbury Annex, approximately 3,600 feet west of the East Gate (Figure 3-10). The site was discovered during the second phase of site investigations by OHM based on the presence of cans and other metal debris.

OHM conducted a magnetometer survey in 1993 to identify buried metal debris. Forty-eight magnetic anomalies were found and flagged, mostly along the southern edge of the swampy area. Five sediment samples (FWISD21 through FWISD25) were collected from five of the magnetic anomalies. Field observations indicated that surface and buried debris corresponded to the magnetic anomalies. The observed cans were empty and rusted. No staining or unusual odors were noted.

Arsenic, copper, iron, lead, nickel, and pesticides DDT, DDD, and DDE were detected at concentrations in excess of sediment background levels (OHM, January 1994, Table 5-9) and ecological sediment screening levels (E&E, September 1994, Table 7-6). Several SVOCs were detected above sediment ecological screening levels in sample FWISD23B.

3.9.2 Planned Supplemental Investigation

Supplemental investigations at SA P59 are intended to further characterize the distribution of SVOCs, pesticides, and metals. The plans and rationale for the SSI program at SA P59 are presented in Tables 3-1, 3-6, and 3-7. The area of planned sampling is shown on Figure 3-10.

An attempt will be made to establish the bounds of the previous geophysical survey. If necessary a supplemental geophysical survey will be conducted, using a magnetometer and metal detector, to supplement the previous geophysical survey conducted at SA P59.

Ten surface samples will be collected along a grid that will be established at the site, encompassing areas with visible debris and areas where geophysical anomalies are identified. The wetland boundary at the site has been flagged by

ABB-ES. Surface samples collected within the delineated wetland will be categorized as sediment samples, and those collected outside the wetland will be categorized as soil samples. For the purpose of this Work Plan, all surface samples are assumed to be sediment samples.

All of the identified anomalies will be investigated in test pits dug with a hand shovel. One test-pit soil sample will be collected from each of the five highest-intensity magnetic anomalies, and a maximum of five additional test-pit soil samples will be collected from anomalies (other than the five highest-intensity magnetic anomalies) where observed conditions (staining, odor, buried drums or other containers) suggest potential contamination. The test pit samples will all be categorized as soil. Debris will not be removed from the test pits. The soil excavated from each test pit will be placed on plastic and returned upon completion to that specific test pit.

All soil and sediment samples will be submitted to an off-site laboratory for analysis for PAL SVOCs, pesticides, and inorganics. Sediment samples will also be analyzed for TOC.

3.10 STUDY AREA P60 - PATROL ROAD DUMP

One empty 55-gallon drum and two smaller empty drums were found at a location between Patrol Road and the boundary fence, along the west side of the northern section of Sudbury Annex. The location was investigated by OHM (September 1995) during the Phase II SI, and has been designated Study Area P60.

3.10.1 Site Description and Previous Findings

The study area is located approximately 1.2 miles from both the Main and North Gates (Figures 3-11) in a low area along the west side of Patrol Road near a wetland associated with Honey Brook drainage (a tributary of Taylor Brook).

OHM collected one composite surface soil sample (FWICD1) from beneath the two small drums and collected one surface soil sample (FWICD2) from beneath the 55-gallon drum (OHM, September 1995). The samples were analyzed for SVOCs, pesticides/PCBs, organophosphate pesticides, and metals. No staining or unusual odors were noted.

Arsenic was detected at 260 μg/g and 460 μg/g in the samples, and was the only analyte detected at a concentration greater than its screening concentration (30 μg/g for Arsenic).

3.10.2 Planned Supplemental Investigation

No supplemental investigations are planned for SA P60. A PRE will be conducted on all contaminants detected at the SA using the existing data for SA P60.

4.0 PROJECT MANAGEMENT

4.1 TASK ORDER STAFFING

The project organization structure is illustrated in Figure 4-1. Solid lines on the figure depict direct lines of control, whereas dotted lines indicate channels of communication. Rationale for project organization and resource allocation are discussed in the Sudbury Annex POP. QA/QC procedures and responsibilities for ABB-ES, USAEC, and Environmental Science & Engineering (ESE) Laboratory personnel are also described in the Sudbury Annex POP (ABB-ES, 1994).

The duties, functions, and responsibilities associated with each task are detailed in the following paragraphs.

Program Manager. The Program Manager for ABB-ES' USAEC efforts is Mr. Joseph T. Cuccaro. He is responsible for providing direction, coordination, and continuous monitoring and review of the program. His responsibilities include initiating program activities; participating in work plan preparation; coordinating staff assignments; assisting in the identification and fulfillment of equipment and special resource needs; monitoring all task activities to confirm compliance with schedule, fiscal, and technical objectives; maintaining communications both internally and with the USAEC Contracting Officer's Representative (COR) through continuous interaction, thereby allowing quick resolution of potential problems; providing final review and approval of work plans, task deliverables, schedules, contract changes, and manpower allocations; and developing coordination among management, field teams, and support personnel to maintain consistency of performance.

Project Manager. The Project Manager for ABB-ES' Sudbury Annex efforts, Mr. Thomas R. Eschner, P.G., has the day-to-day responsibility for conducting the Sudbury Annex project. The Project Manager is responsible for confirming the appropriateness and adequacy of the technical or engineering services provided for a specific task; developing the technical approach and level of effort required to address each element of a task; supervising day-to-day conduct of the work, including integrating the efforts of all supporting disciplines and subcontractors for all tasks; overseeing the preparation of all reports and plans; providing for QC and quality review during performance of the work; confirming technical integrity,

clarity, and usefulness of task work products; forming a task group with expertise in disciplines appropriate to accomplish the work; reviewing and approving sampling tests and QA plans, which include monitoring site locations, analysis methods to be used, and hydrologic and geophysical techniques to be used; developing and monitoring task schedules; supervising task fiscal requirements (e.g., funds management for labor and materials), and reviewing and approving all invoicing actions; and providing day-to-day communication, both within the ABB-ES team and with the USAEC COR, on all task matters, including task status reporting.

Corporate Officer. ABB-ES' Corporate Officer, David B. Ertz, P.E., is responsible for ensuring that a contract for the services to be provided has been executed; necessary corporate resources are committed to conduct the program activities; corporate level input and response is readily available to both the ABB-ES team and the USAEC COR; and assistance is provided to the Program and Project Managers for project implementation.

Technical Director and Project Review Committee. The members of the Project Review Committee for this Task Order are Mr. Ronald Lewis, Ms. Barbara Varoutsos, and Mr. Jeffrey Pickett. Mr. Picket will also serve as chairman of the Project Review Committee. The function of this group of senior technical and/or management personnel is to provide guidance and oversight on the technical aspects of the project. This is accomplished through periodic reviews of the services provided to confirm they represent the accumulated experience of the firm, are being produced in accordance with corporate policy, and live up to the objectives of the program as established by ABB-ES and USAEC.

Quality Assurance Supervisor. Mr. Christian Ricardi is the QA Supervisor for ABB-ES' USAEC program and this project. The QA function has been established so that appropriate protocols from USAEC, Commonwealth of Massachusetts, and USEPA Region 1 are followed. In addition, the QA Supervisor must confirm that QC plans are in place and implemented for each element of the task. The QA Supervisor reports directly to the Program Manager, but is responsible to the Project Manager in matters related to management of the QA/QC work element. The QA Supervisor is independent of the Project Manager relative to corrective action. The QA Supervisor has authority to stop work that is not in compliance with the POP, provided he has

the concurrence of the USAEC Chemistry Branch, the Program Manager, the COR, and the Contracting Officer.

Health and Safety Supervisor. Ms. Cynthia E. Sundquist is the Health and Safety Supervisor for the Sudbury Annex project, reporting directly to the Project Manager. She has stop work authority to prevent or mitigate any unacceptable health and safety risks to project personnel, the general public, or the environment. Responsibilities of this position include confirming that the project team and, in particular, field personnel, comply with the ABB-ES HASP; helping the Program Manager and Project Manager develop the site-specific HASP; making certain that the HASP is distributed to appropriate personnel; and informing the Program Manager and the appropriate USAEC personnel in the specified manner when any health- or safety-related incident occurs.

Contract Manager. Ms. Elaine H. Findlay is the Contract Manager for the Sudbury Annex effort. The Contract Manager supports the Program Manager and Project Manager in all contractual matters, providing a liaison between contract representatives for USAEC and all subcontracted services.

Project Administrator. Ms. Dana Porter is the Project Administrator for the Sudbury Annex effort. The Project Administrator supports the Program Manager and Project Manager in the day-to-day monitoring of fiscal, schedule, and documentation requirements. She is responsible for maintaining the necessary systems to support budget monitoring and controls, and schedule monitoring and maintenance; and for controlling the flow and processing of documentation.

SSI Task Manager. Mr. Douglas Pierce will serve as Task Manager for the Sudbury Annex SSI. As a Task Manager, he is responsible for planning all ABB-ES' geologic and hydrogeologic investigations at Sudbury Annex. He also is responsible for the interpretation of all chemical and hydrogeologic information and data for the preparation of the SSI Report.

Field Operations Leader. Mr. Joel Rowland will serve as the Field Operations Leader for the Sudbury Annex Field Program. As Field Operations Leader, he is responsible for conducting the field program in accordance with procedures outlined in the Work Plan and POP.

Laboratory/Data Management Leader. Mr. Tim Dame, as the coordinator of laboratory services, is responsible for implementing and maintaining the Sudbury Annex analytical program. His responsibilities as the Laboratory Management Leader will include coordination with the Project Manager, QA Supervisor, and the analytical subcontractor on overall project and individual site analytical efforts. As the Data Management Leader, Mr. Dame is responsible for operating and maintaining the database management systems committed to USAEC projects.

4.2 SUBCONTRACTORS

The following services and/or activities will be performed by subcontractors during the SSI field investigation activities at Sudbury Annex: field drilling and monitoring well installation, surveying, IDW disposal, and laboratory chemical analysis.

Drilling Services. A drilling subcontractor will be chosen from among qualified bidders through a competitive bidding process. The drilling subcontractor will be responsible for mobilizing the proper drilling equipment to complete the soil boring and monitoring well installation in accordance with the work plan and POP. The Field Operations Leader will be responsible for coordinating and overseeing the activities of the drilling subcontractors.

Surveying Services. A professional land surveying company, registered in the Commonwealth of Massachusetts, will be subcontracted to establish map coordinates and elevations for new monitoring wells and soil and sediment sampling locations. Surveying activities will be coordinated and monitored by the Field Operations Leader.

Investigation-derived Waste Disposal. A subcontractor will be chosen through a competitive bidding process. The subcontractor will be responsible for removing and disposing of soil and/or water generated during the SSI program. The subcontractor will be responsible for disposing of the waste in accordance with all state and federal regulations.

Laboratory Chemical Analysis. Analytical services for the Sudbury Annex SSI field investigations will be subcontracted to ESE of Gainesville, Florida. ESE's analytical program is USAEC-approved.

5.0 SCHEDULE

ABB-ES' projection of the schedule for the SSI at Sudbury Annex (Figure 5-1) allows for the regulatory review and approval period specified in the Federal Facility Agreement for all deliverables.

The field tasks are scheduled to be completed in five-day work shifts during the 12 weeks following authorization to proceed. The fieldwork is anticipated to commence in June 1996.

ABB-ES	ABB Environmental Services, Inc.
ADL	Arthur D. Little Co.
AEHA	U.S. Army Environmental Hygiene Agency
AOC	area of contamination
ATEC	ATEC Environmental Consultants
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFHA	Capehart Family Housing Area
D&M	Dames & Moore
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyl dichloroethene
DDT	dichlorodiphenyltrichloroethane
DNAPL	dense nonaqueous-phase liquid
DOD	U.S. Department of Defense
DQO	data quality objective
E&E	Ecology & Environment, Inc.
FEMA	Federal Emergency Management Agency
FS	feasibility study
FSP	Field Sampling Plan
GZA	GZA Geoenvironmental, Inc.
HASP	Health and Safety Plan
IDW	investigation-derived waste
IRP	Installation Restoration Program
MABSP	Maynard Ammunition Backup Storage Point
MADEP	Massachusetts Department of Environmental Protection
MASD	Maynard Ammunition Sub-Depot

MCP	Massachusetts Contingency Plan
MEP	Master Environmental Plan
MFFA	Massachusetts Fire Fighting Academy
mg/kg	milligrams per kilogram
MOTS	Maynard Ordnance Test Station
MRE	Meals-Ready-to-Eat
NARADCOM	U.S. Army Natick Research and Development Command
NFA	no further action
NPL	National Priorities List
NUS	NUS, Inc.
OHM	OHM Corporation
OU	operable unit
PA	preliminary assessment
PAH	polynuclear aromatic hydrocarbons
PAL	project analyte list
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene
PCL	protective contaminant level
POL	petroleum, oil, and lubricant
POP	Project Operations Plan
PRE	preliminary risk evaluation
QA	quality assurance
QAPjP	Quality Assurance Project Plan
QC	quality control
RI	remedial investigation
SA	study area
SAP	Sampling and Analysis Plan
SI	site investigation
SSI	supplemental site investigation
SVOC	semivolatile organic compound

TAL	target analyte list
TCL	target compound list
TOC	total organic carbon
TPHC	total petroleum hydrocarbons
USAEC	U.S. Army Environmental Center
USAF	U.S. Air Force
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USEPA	U.S. Environmental Assessment Agency
µg/g	micrograms per gram
µg/L	micrograms per liter
UST	underground storage tank
VOC	volatile organic compound

ABB Environmental Services, Inc. (ABB-ES), 1993. "Final Site Investigation Report, Fort Devens, Groups 2, 7, and Historic Gas Stations"; Portland, ME; prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, MD; May.

ABB Environmental Services, Inc. (ABB-ES), 1995. "Draft Master Environmental Plan, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts"; Portland, ME; prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, MD; December.

ABB Environmental Services, Inc. (ABB-ES), 1995a. "Final Project Operations Plan, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts"; Portland, ME; prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, MD; April.

ABB Environmental Services, Inc. (ABB-ES), 1995b. "Final Work Plan, Supplemental Site Investigations, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts"; Portland, ME; prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, MD; April.

ABB Environmental Services, Inc. (ABB-ES), 1995. "Supplemental Site Investigation Data Packages for Study Areas A3, A5, A10, A11, P5, P6, P9, P16, P23, P27, P28, P31, P38, P41, P45, P54, and P58, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts"; Portland, ME; prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, MD; November.

Dames & Moore (D&M), 1992. "Final Community Relations Plan, Sudbury Training Annex, Sudbury, Massachusetts"; Bethesda, MD; prepared for U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, MD; April.

Ecology & Environment, Inc., 1994. "Draft Master Environmental Plan, Fort Devens Sudbury Training Annex Site, Sudbury, Massachusetts"; Arlington, VA; prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD; May.

Ecology & Environment, Inc., 1994. "Phase II Site Investigations, Final Report, Fort Devens Sudbury Training Annex, Massachusetts"; 3 volumes; Arlington, VA; prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD; September.

Ecology & Environment, Inc., 1995. "Draft Final Phase II Remedial Investigations Report, Sites P11/P13 and A12/P36/P37, Fort Devens Sudbury Training Annex, Sudbury, Massachusetts"; 3 volumes; Arlington, VA; prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD; June.

Fort Devens, 1990. "Additional Installation Restoration Program (IRP) Sites for Investigation at Sudbury Training Annex, Sudbury, Massachusetts"; Memorandum for Commander, USATHAMA; May 8.

Hansen, W.R., 1956. "Geology and Mineral Resources of the Hudson and Maynard Quadrangles, Massachusetts"; U.S. Geological Survey; Bulletin 1038; Washington, D.C.

OHM Corporation (OHM), 1992. "Final Master Environmental Plan for the Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts"; Pittsburgh, PA; prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD; January.

OHM Corporation (OHM), 1994. "Final Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts"; Pittsburgh, PA; prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD; January.

OHM Corporation (OHM), 1995a. "Final Feasibility Study at Fort Devens Sudbury Training Annex Areas of Contamination A7 and A9"; Pittsburg, PA; prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, MD; May.

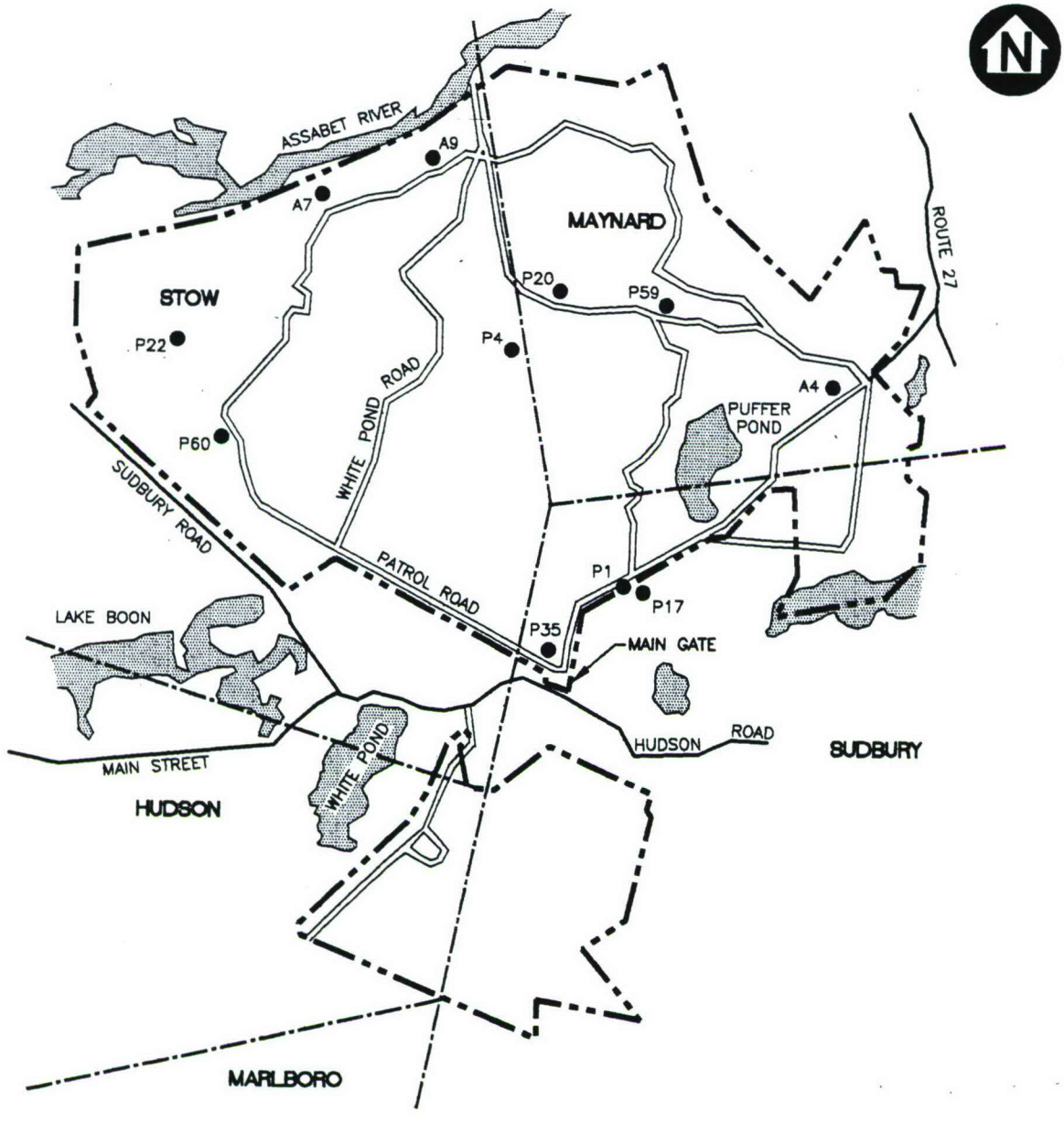
OHM Corporation (OHM), 1995b. "Final Addendum, Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts"; Pittsburgh, PA; prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD; September.

Suter, G.W. II, and M.E. Will, 1994. "Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Terrestrial Plants; 1994 Revision"; ES/ER/TM-85/RI; Oak Ridge National Laboratory, Oak Ridge, TN; prepared for U.S. Department of Energy Office of Environmental Restoration and Waste Management; September.

U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), 1980. "Installation Assessment of U.S. Army Natick Research and Development Command; Report 170; May.

U.S. Environmental Protection Agency, 1982. "Installation Assessment NARADCOM Research and Development Laboratory, Massachusetts; prepared for USATHAMA; March.

Zen, E-An, Ed., 1983. "Bedrock Geology of Massachusetts"; U.S. Geological Survey; scale 1:250,000; 3 sheets.



LEGEND

TOWN LINE

A4 STUDY AREA

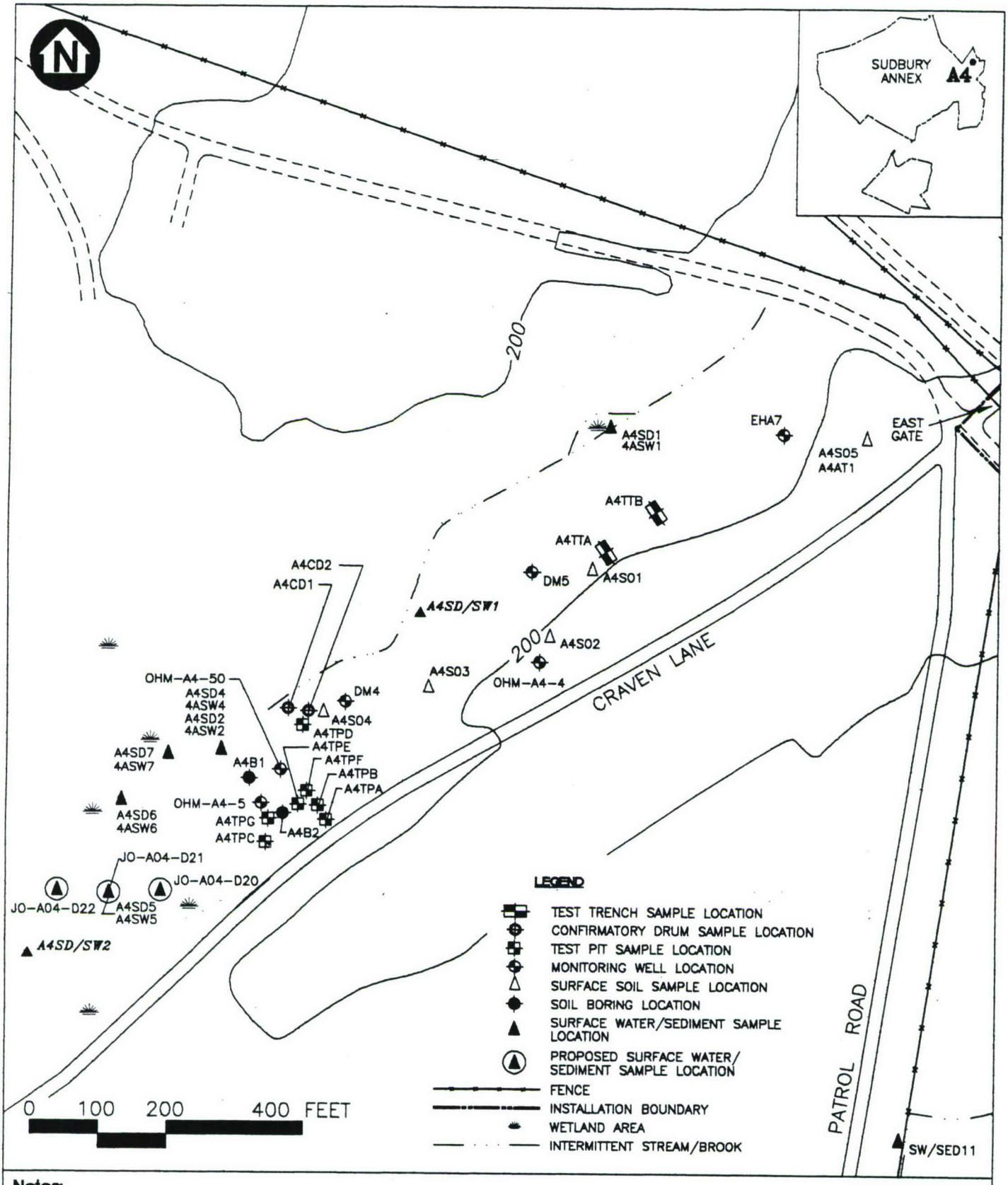
INSTALLATION BOUNDARY

0 1500 3000 6000 FEET

FIGURE 1–1
LOCATION OF STUDY AREAS
FINALIZATION OF SELECTED STUDY AREAS
FORT DEVENS SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

ABB Environmental Services

J:\7148-01\FIG\7148F120.DWG (1=1)



J:\8720-01\FIG\7148F097.DWG 3/01/96

Notes:

1. Locations based on review of historical site maps.
2. Historical A4SD3/A4SW3 is located approximately 950 feet west of A4SW5.

FIGURE 3-1
EXPLORATION LOCATIONS, AREA OF CONTAMINATION A4
FINALIZATION OF SELECTED STUDY AREAS
FORT DEVENS SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

ABB Environmental Services

ASSABET RIVER

AREA OF CONTAMINATION A9

A7 SUDBURY ANNEX

INSTALLATION BOUNDARY

TRACK ROAD

PATROL ROAD

LEGEND

- CONFIRMATORY DRUM SAMPLE LOCATION
- MONITORING WELL LOCATION
- STAFF GAUGE LOCATION
- SURFACE WATER/SEDIMENT SAMPLE LOCATION
- SURFACE SOIL SAMPLE LOCATION
- SOIL BORING LOCATION
- PROPOSED MONITORING WELL LOCATION
- FENCE
- INSTALLATION BOUNDARY
- STREAM/WATER EDGE
- STUDY AREA A7 BOUNDARY
- TREE LINE
- 210 CONTOUR LINE

DETAIL - TEST TRENCH LOCATIONS

0 25 50 100 FEET

Notes:

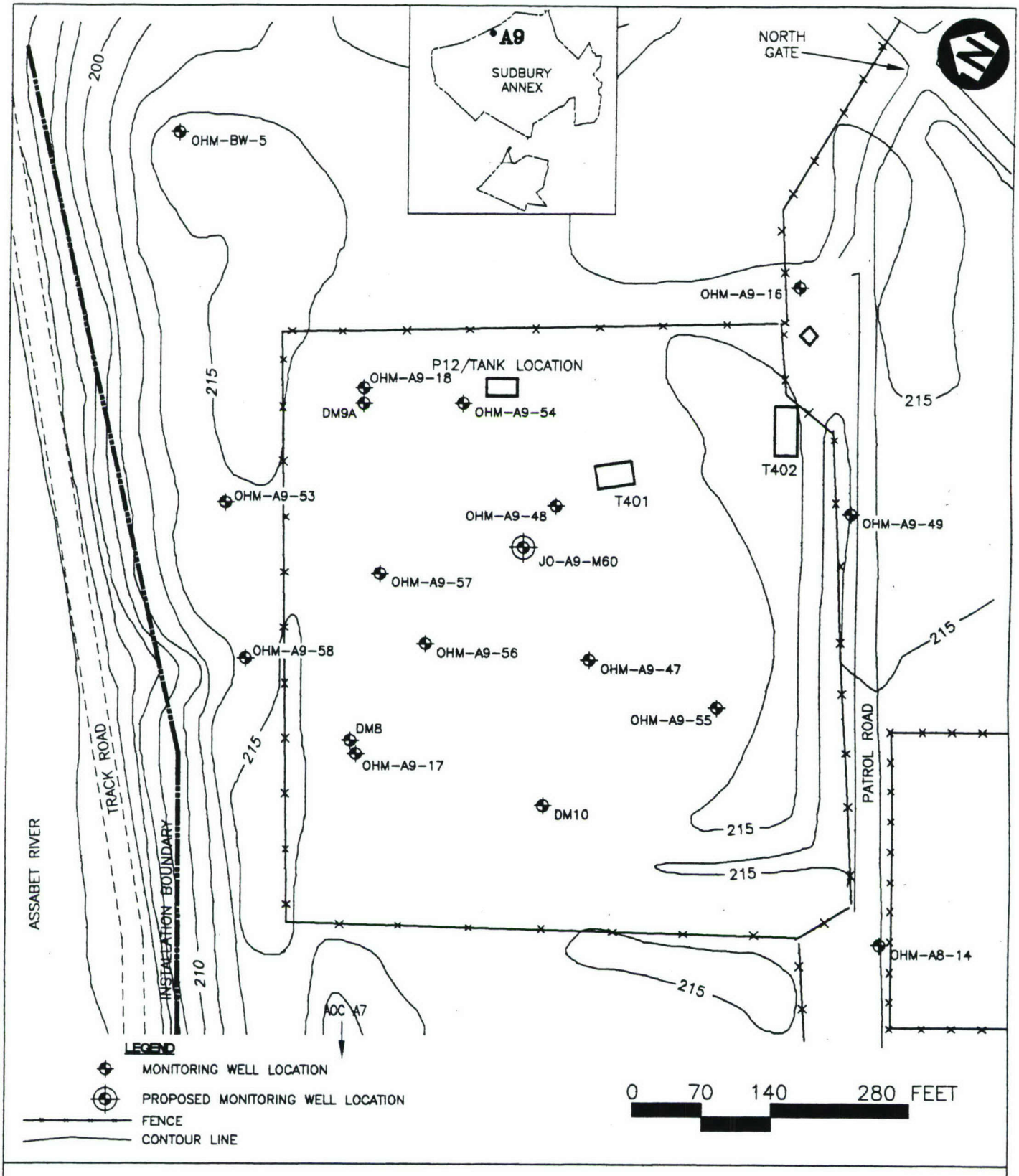
1. Locations based on a review of historical site maps.
2. A7HA3 collected from same location as A7TPE.
3. A7HA4 collected from same location as A7CD2.
4. A7S013 collected from same location as A7S06.

0 50 100 200 FEET

FIGURE 3-2
EXPLORATION LOCATIONS, AREA OF CONTAMINATION A7
FINALIZATION OF SELECTED STUDY AREAS
FORT DEVENS SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

ABB Environmental Services

J:\8720-01\FIG\7148F101.DWG (1=100) 3/01/96



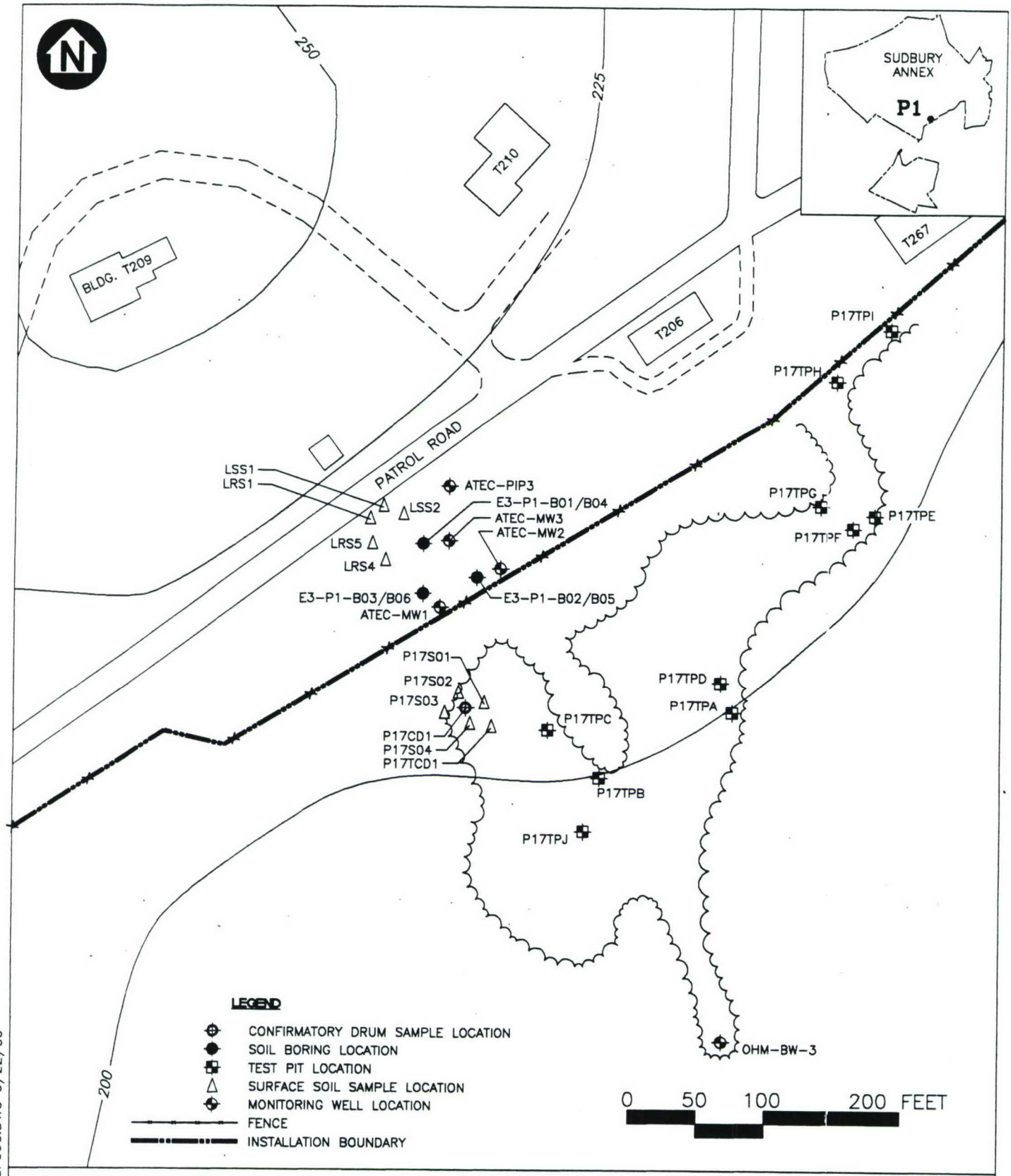
Note:

1. Locations based on review of historical site maps.

FIGURE 3-3
EXPLORATION LOCATIONS
AREA OF CONTAMINATION A9
FINALIZATION OF SELECTED STUDY AREAS
FORT DEVENS SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

ABB Environmental Services

J:\8720-01\FIG\8720F009.DWG 3/4/96 (1=72.5)



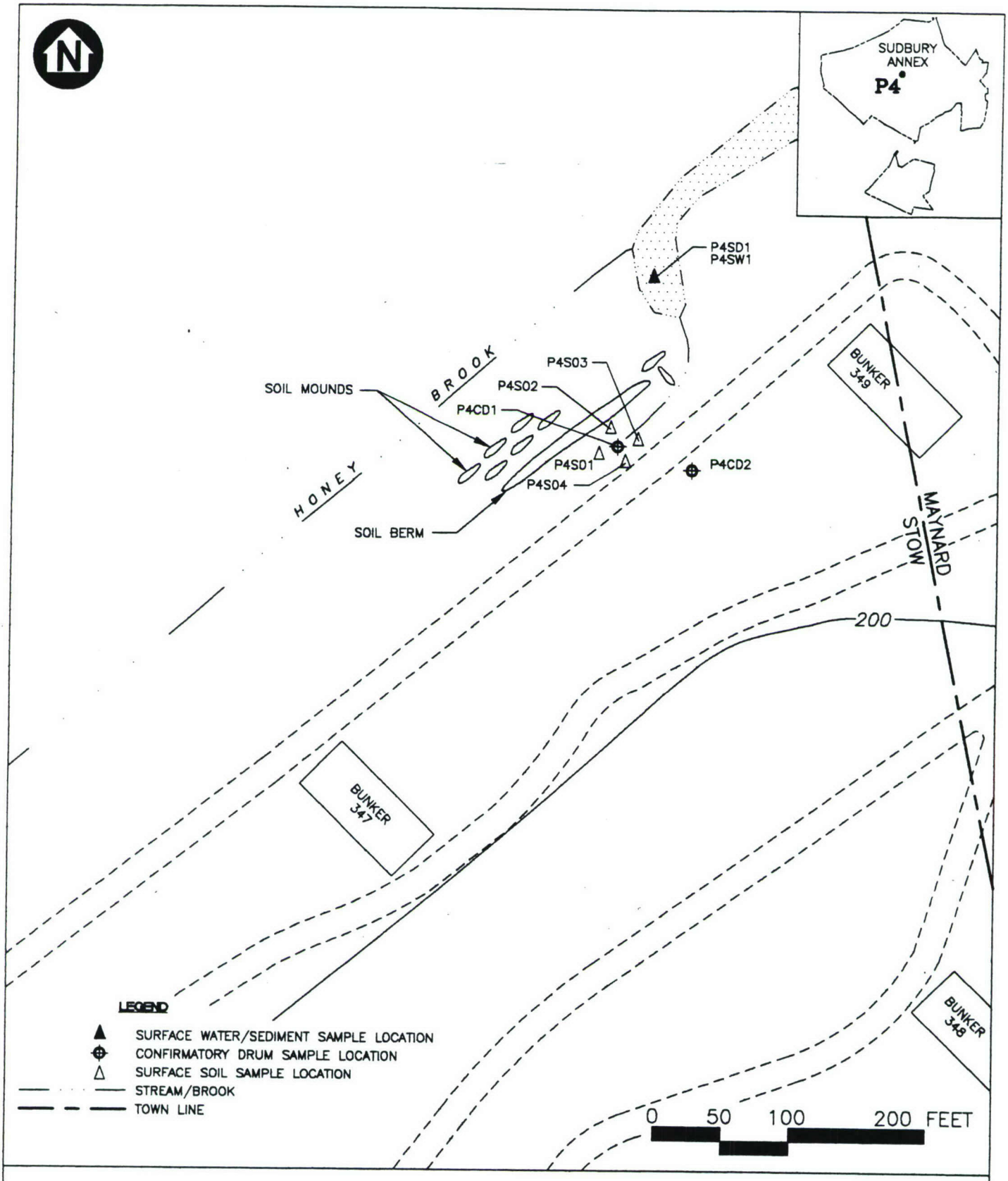
J:\8720-01\FIG\7148F095.DWG 5/22/96

Note:

1. Locations based on review of historical site maps.

FIGURE 3-4
EXPLORATION LOCATIONS, STUDY AREA P1
FINALIZATION OF SELECTED STUDY AREAS
FORT DEVENS SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

ABB Environmental Services



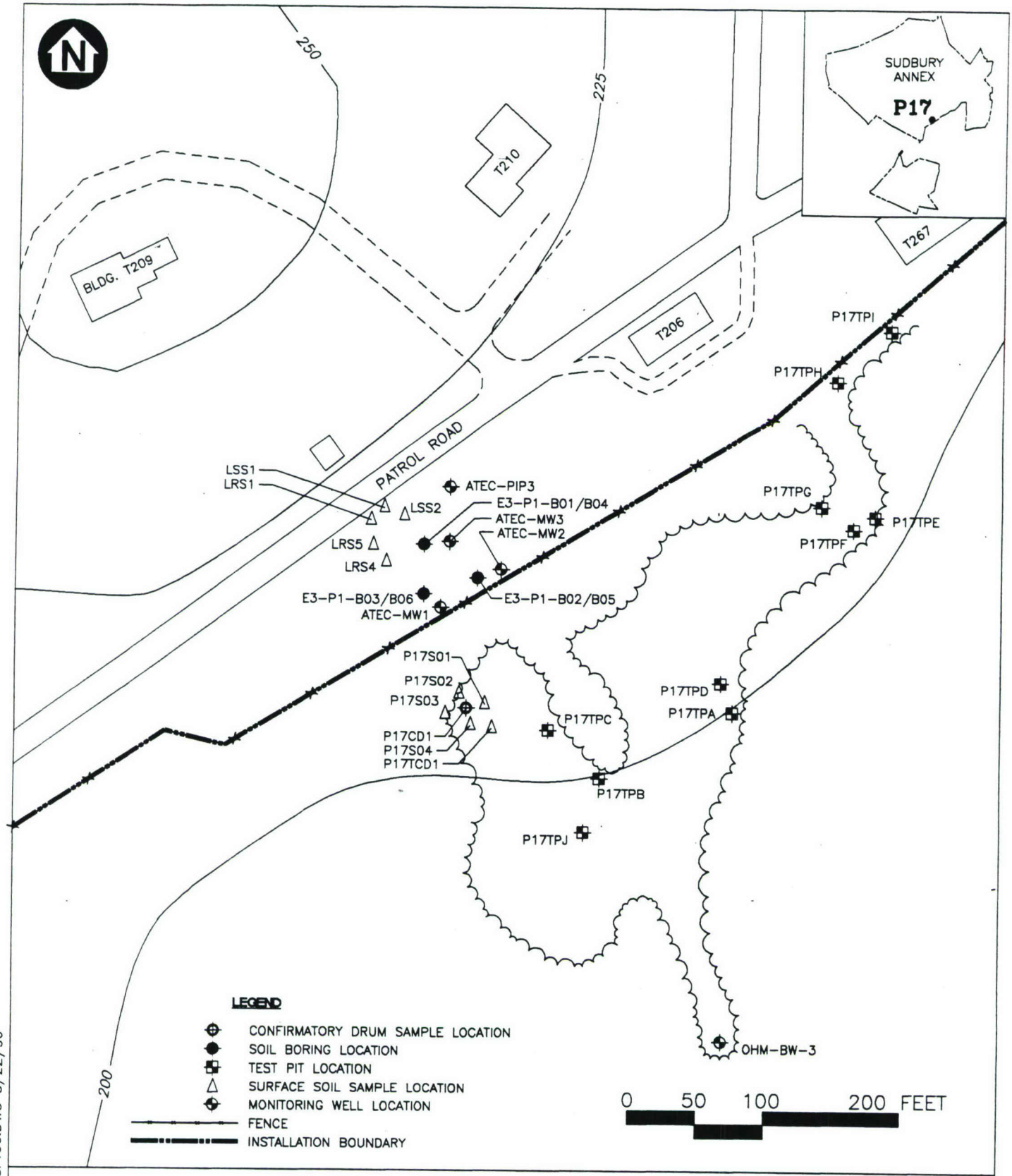
Note:

1. Locations based on review of historical site maps.

FIGURE 3-5
EXPLORATION LOCATIONS, STUDY AREA P4
FINALIZATION OF SELECTED STUDY AREAS
FORT DEVENS SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

ABB Environmental Services

J:\8720-01\FIG\7148F096



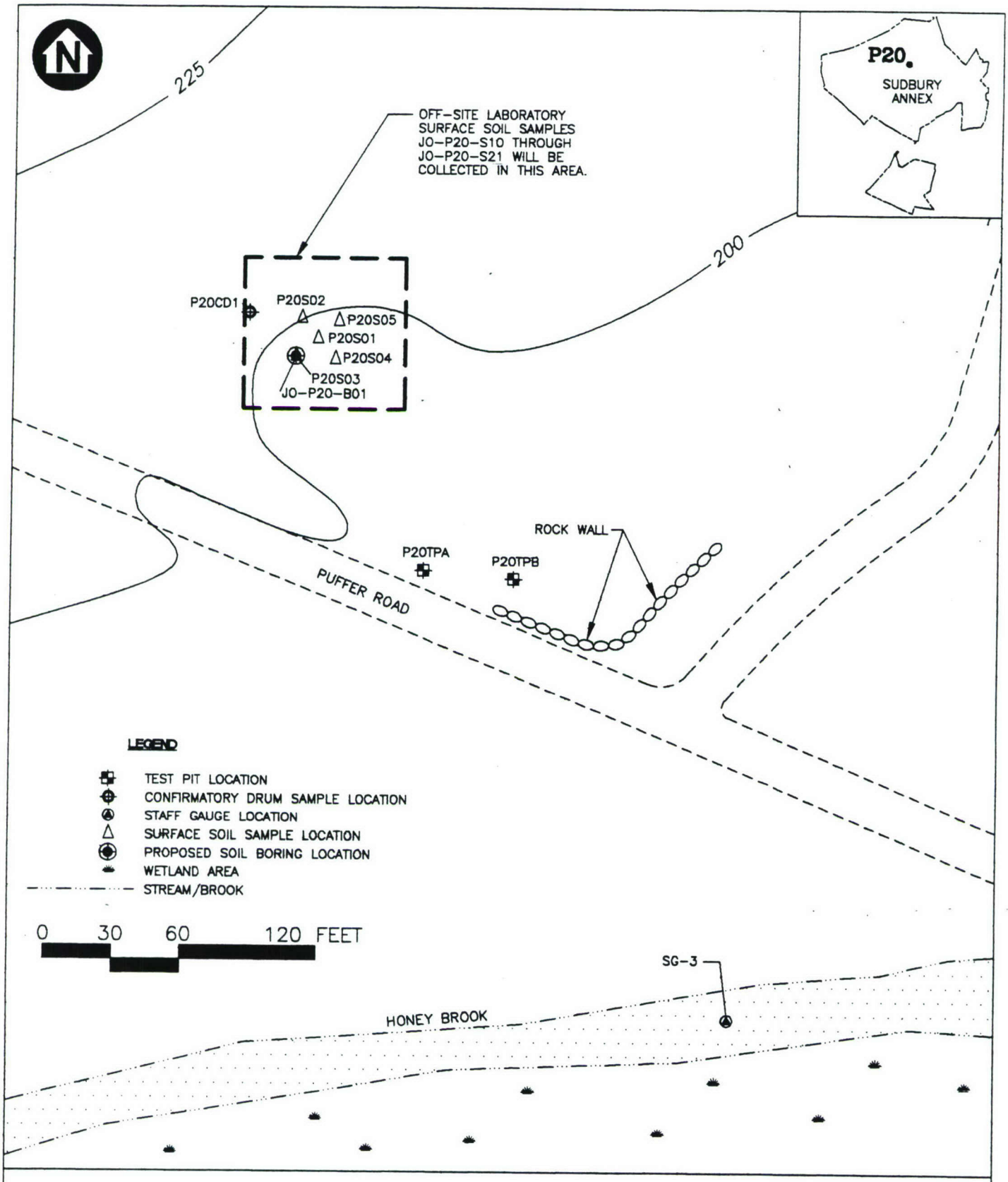
J:\8720-01\FIG\7148F100.DWG 5/22/96

Note:

1. Locations based on review of historical site maps.

FIGURE 3-6
EXPLORATION LOCATIONS, STUDY AREA P17
FINALIZATION OF SELECTED STUDY AREAS
FORT DEVENS SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

ABB Environmental Services



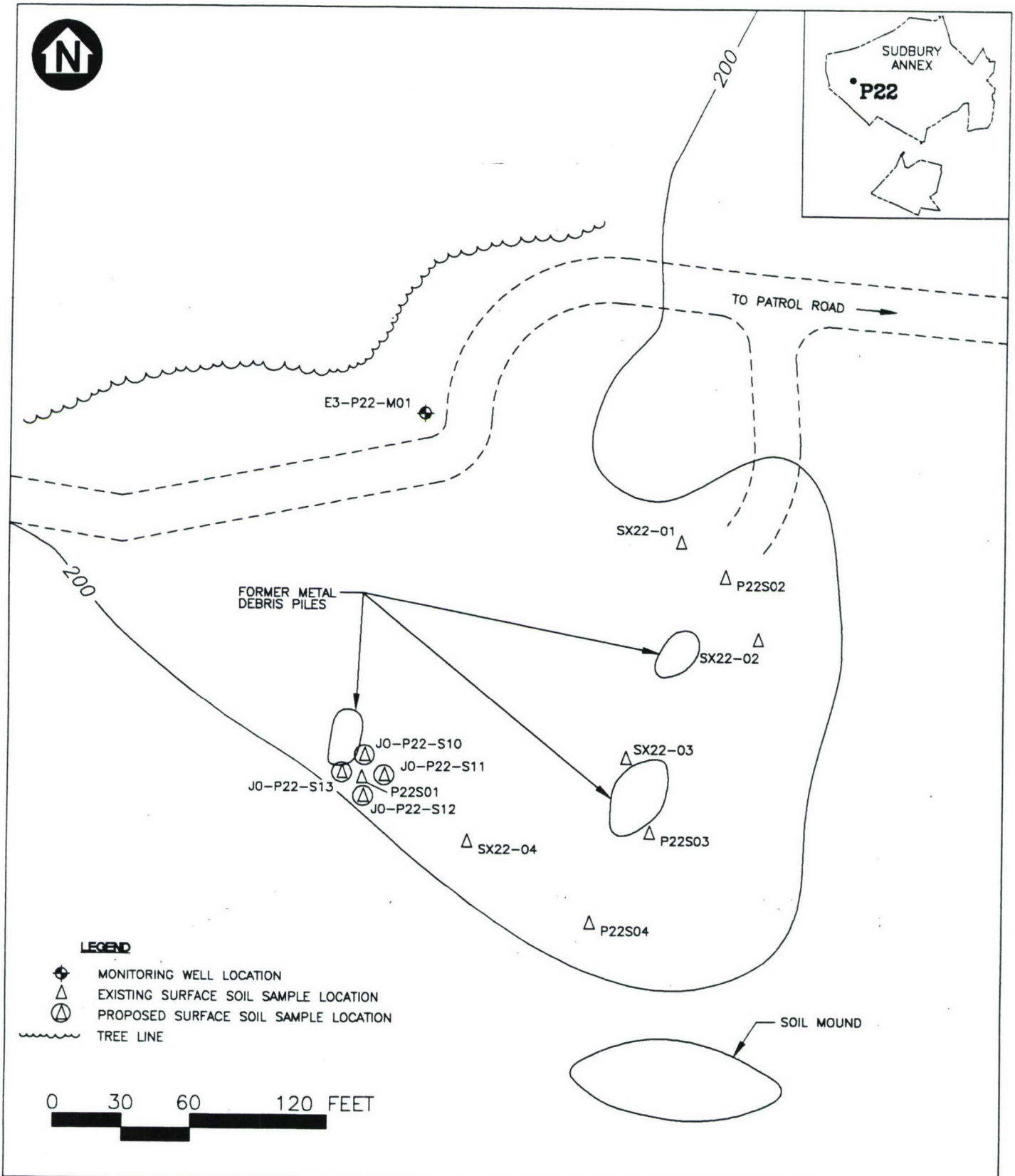
Note:

1. Locations based on review of historical site maps.

FIGURE 3-7
EXPLORATION LOCATIONS, STUDY AREA P20
FINALIZATION OF SELECTED STUDY AREAS
FORT DEVENS SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

ABB Environmental Services

J:\8720-01\FIG\7148F094



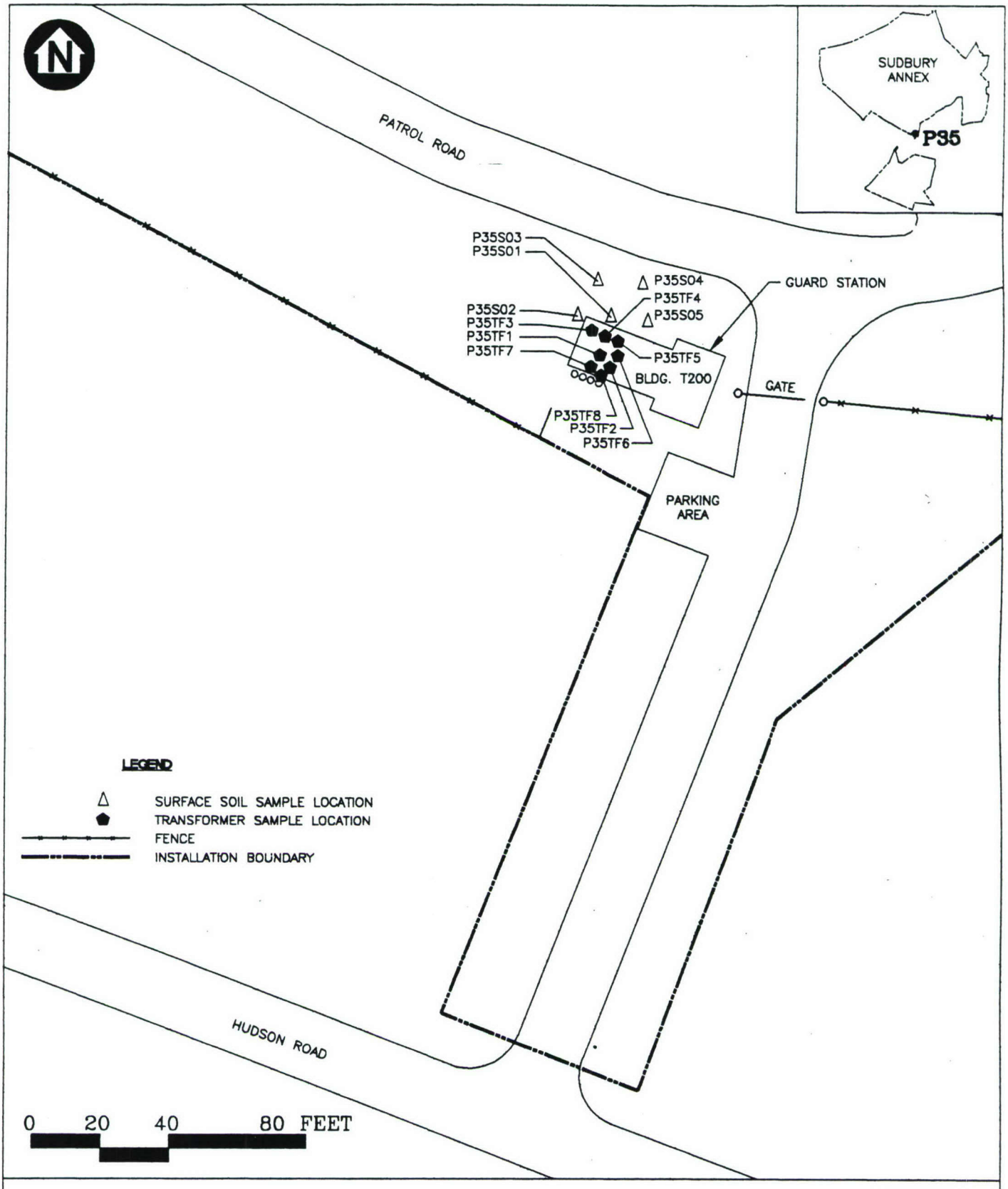
J:\8720-01\FIG\7148F092.DWG 5/24/96

Note:

1. Locations based on review of historical site maps.

FIGURE 3-8
EXPLORATION LOCATIONS, STUDY AREA P22
FINALIZATION OF SELECTED STUDY AREAS
FORT DEVENS SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

ABB Environmental Services



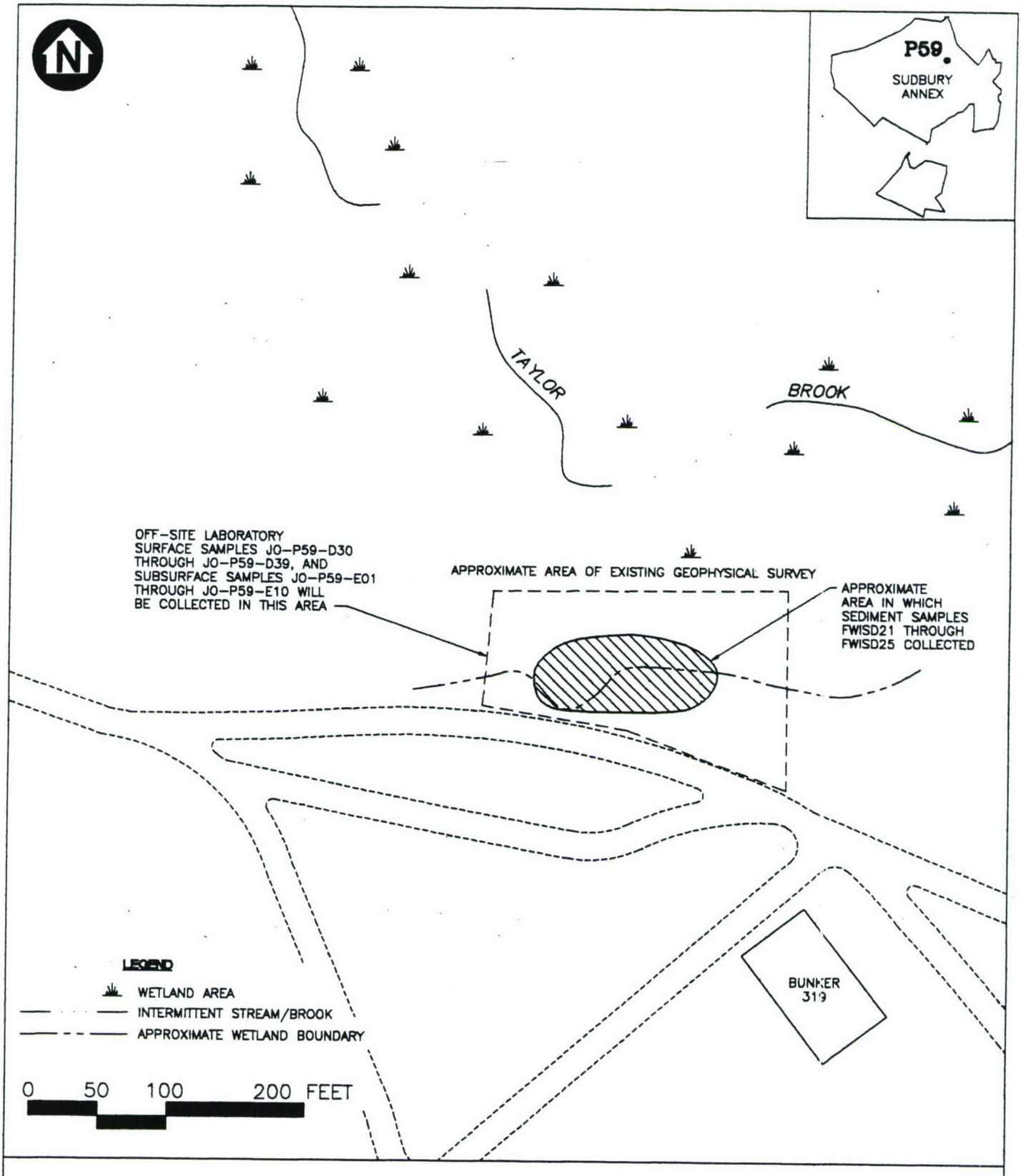
J:\8720-01\FIG\7148F093.DWG

Note:

1. Locations based on review of historical site maps.

FIGURE 3-9
EXPLORATION LOCATIONS, STUDY AREA P35
FINALIZATION OF SELECTED STUDY AREAS
FORT DEVENS SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

ABB Environmental Services



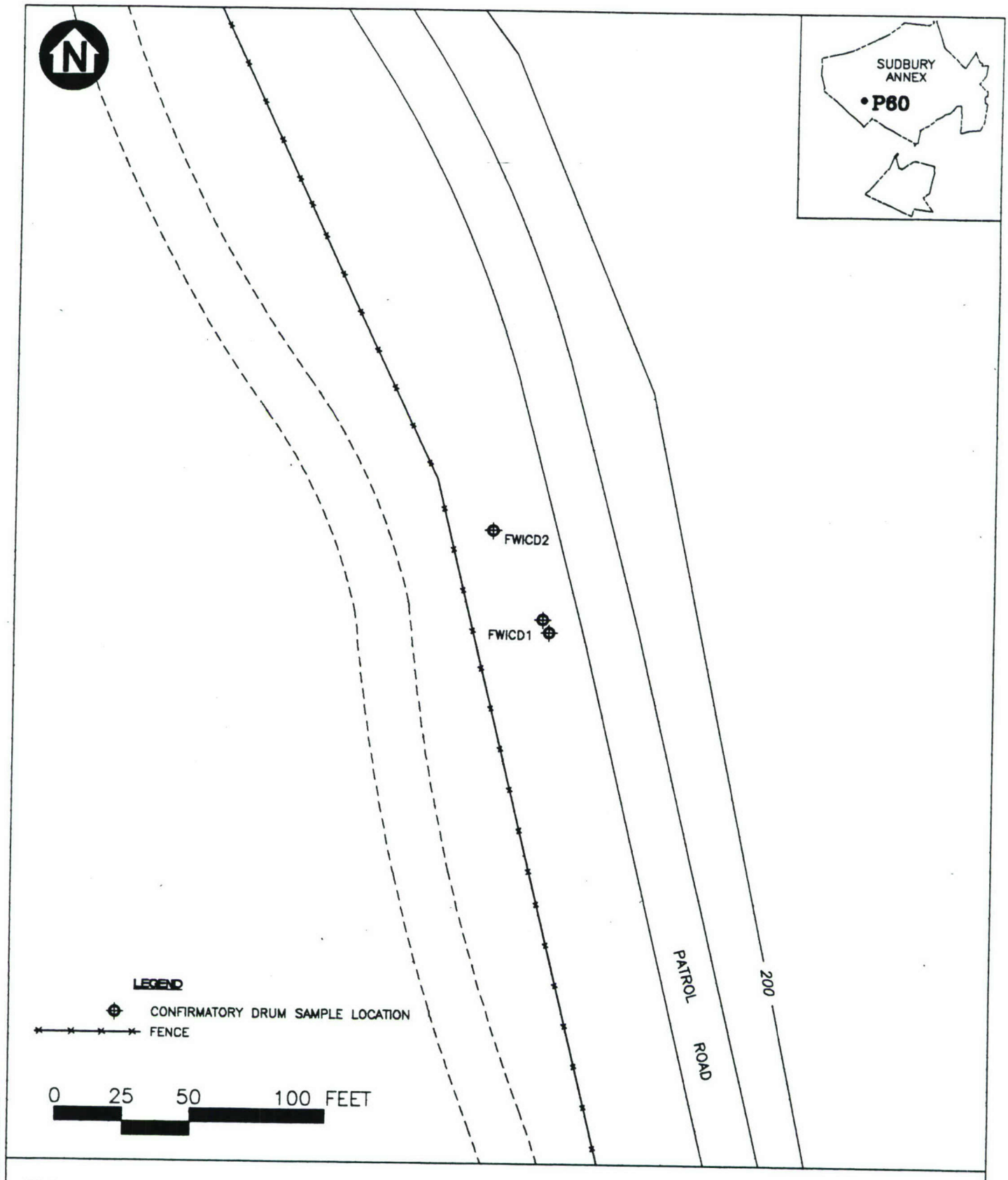
Note:

Locations based on review of historical site maps.

FIGURE 3-10
EXPLORATION LOCATIONS, STUDY AREA P59
FINALIZATION OF SELECTED STUDY AREAS
FORT DEVENS SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

ABB Environmental Services

J:/8720-01\FIG\7148F052.DWG 3/01/96



Note:

1. Locations based on review of historical site maps.

FIGURE 3–11
EXPLORATION LOCATIONS, STUDY AREA P60
FINALIZATION OF SELECTED STUDY AREAS
FORT DEVENS SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

ABB Environmental Services

J:\8720-01\FIG\7148F091.DWG

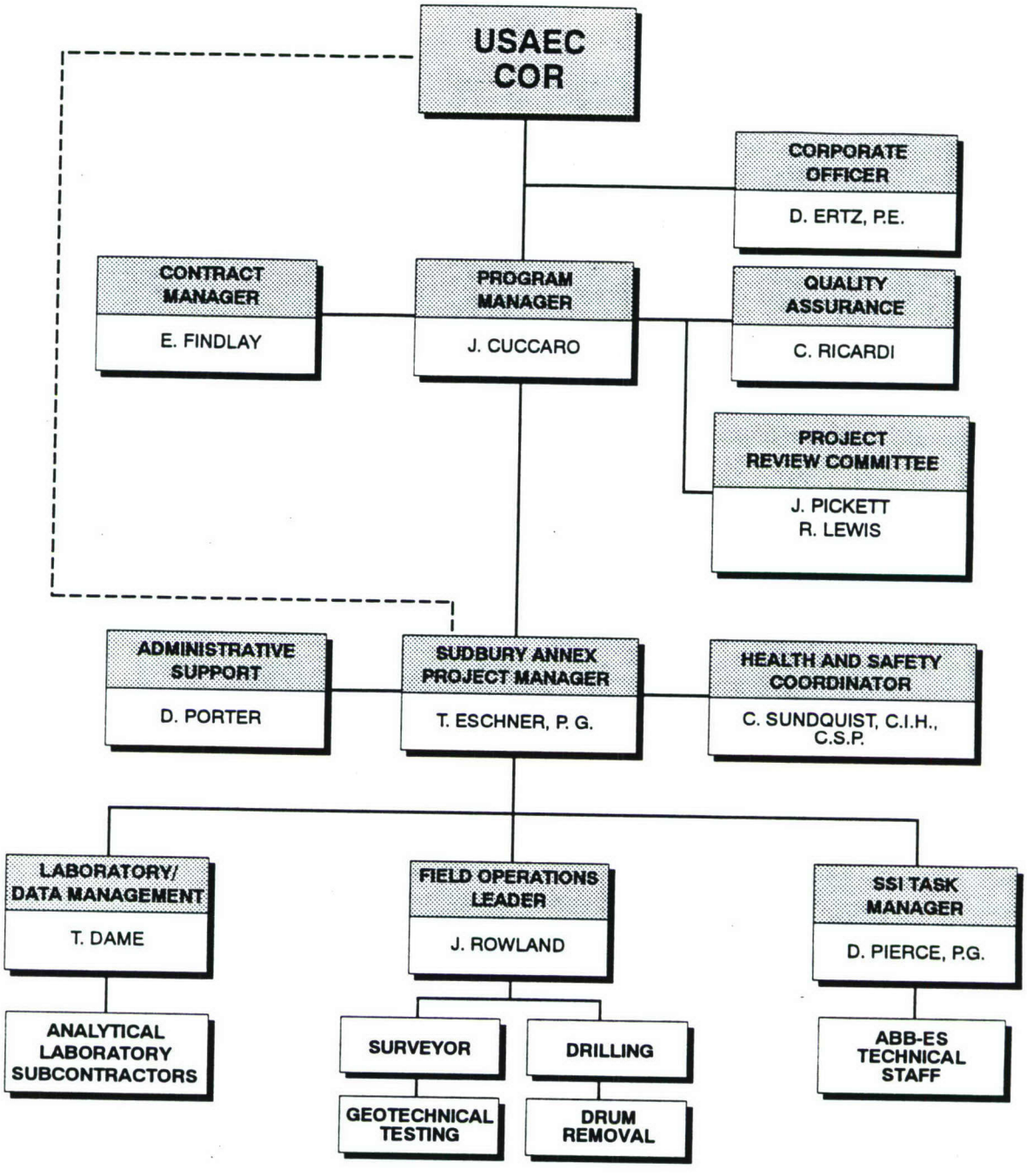


FIGURE 4-1
PROJECT ORGANIZATION
FINIALIZATION OF SELECTED STUDY AREAS
SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

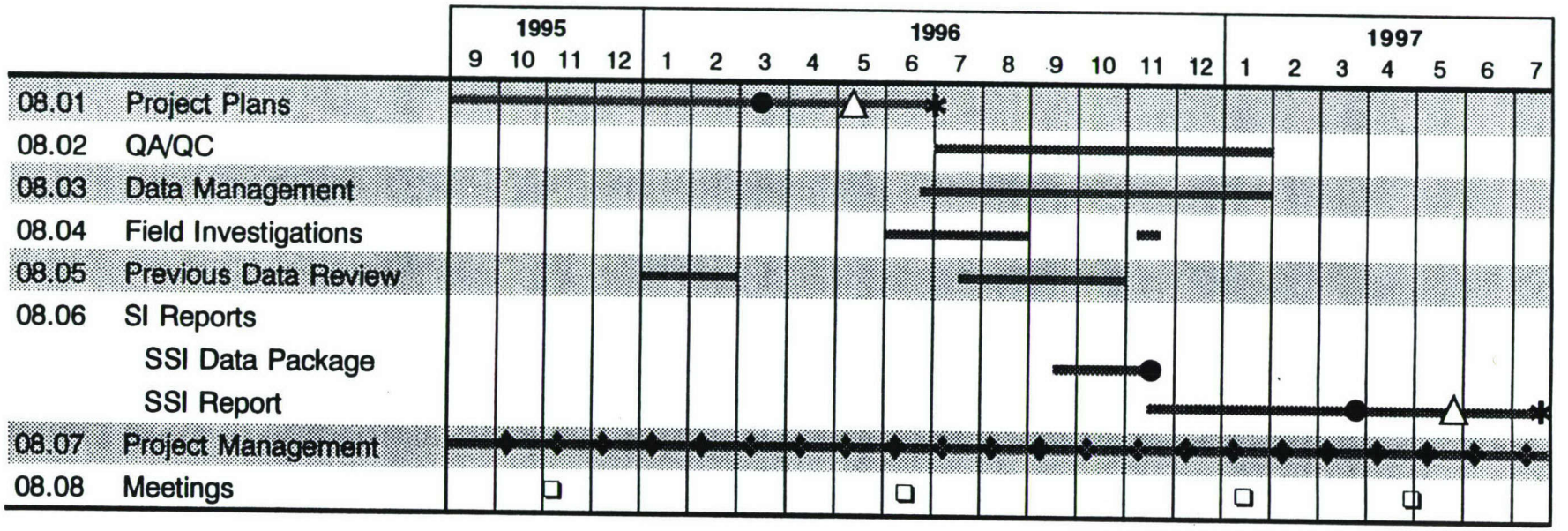


FIGURE 5-1
PROJECT SCHEDULE
FINALIZATION OF SELECTED STUDY AREAS
SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

TABLE 2-1
SOIL BACKGROUND CONCENTRATIONS

SUPPLEMENTAL SITE INVESTIGATION
FORT DEVENS SUDBURY TRAINING ANNEX
SUDBURY, MASSACHUSETTS

ANALYTE	SUDBURY ANNEX BACKGROUND CONCENTRATION (ug/g)[a]	RANGE FOR SOIL IN EASTERN U.S. (ug/g)[b]
INORGANICS		
Aluminum	18,000	7,000 – >100,000
Antimony	0.99	<1 – 8.8
Arsenic	17	<0.1 – 73
Barium	26.3	10 – 1,500
Beryllium	0.64	<1 – 7
Cadmium	0.76	–
Calcium	1,170	100 – 280,000
Chromium (total)	21.4	1 – 1,000
Cobalt	7.3	<0.3 – 70
Copper	13.3	<1 – 700
Iron	15,000	100 – >100,000
Lead	150	<10 – 300
Magnesium	2,500	50 – 50,000
Manganese	260	<2 – 7,000
Mercury	0.17	0.01 – 3.4
Nickel	11.6	<5 – 700
Potassium	700	50 – 37,000
Selenium	0.57	<0.1 – 3.9
Silver	0.37	–
Sodium	132	<500 – 50,000
Thallium	0.25	–
Vanadium	33	<7 – 300
Zinc	47.5	<5 – 2,900
PESTICIDES		
alpha-BHC	0.005	–
beta-BHC	0.004	–
delta-BHC	0.011	–
alpha-Chlordane	0.004	–
gamma-Chlordane	0.011	–
Dieldrin	0.014	–
beta-Endosulfan	0.005	–
Endosulfan sulfate	0.008	–
Endrin	0.008	–
Endrin Aldehyde	0.014	–
Heptachlor Epoxide	0.002	–
Lindane	0.010	–
DDT	0.139	–
DDD	0.063	–
DDE	0.139	–
TOTAL DDT	0.175	–

NOTES: a) Derived from background data reported by E&E (July 1994) and OHM (January 1994); maximum concentrations after removal of statistical outliers.

b) Source: Shacklette and Boerngen (1984)

TABLE 2–2
SURFACE WATER AND SEDIMENT BACKGROUND CONCENTRATIONS

SUPPLEMENTAL SITE INVESTIGATION
FORT DEVENS SUDBURY TRAINING ANNEX
SUDBURY, MASSACHUSETTS

ANALYTE	SEDIMENT (ug/g)		SURFACE WATER (ug/L)	
	STREAMS	PONDS	STREAMS	PONDS
INORGANICS				
Aluminum	5,020	5,740	400	69.2
Antimony	<0.5	<0.5	<5	<5
Arsenic	2.03	9.56	3.15	<2
Barium	23.9	55.3	10.4	14
Beryllium	0.18	<0.5	<5	<5
Cadmium	<0.5	2.06	<5	<5
Calcium	562	4,550	8,520	8,730
Chromium (total)	9.66	12.8	3.16	<10
Cobalt	3.74	11.4	4.79	2.32
Copper	6.33	10.9	<10	<10
Iron	7,590	16,300	4,810	1,110
Lead	4.48	49.4	10.3	3.02
Magnesium	2,140	1,480	1,890	2,250
Manganese	70.5	74.1	156	26.6
Nickel	5.92	23.2	<10	11.3
Potassium	1,520	900	2,060	3,640
Selenium	0.2	<0.2	<2	<2
Silver	–	0.879	–	ND
Sodium	R	778	14,000	18,000
Thallium	0.195	<0.5	ND	ND
Vanadium	17	21.8	4.72	10
Zinc	20.8	55.3	13.3	67.8
PESTICIDES				
Aldrin	0.007	–	ND	–
Endosulfan sulfate	0.001	–	ND	–
Lindane	0.001	–	ND	–
DDT	–	<0.01	–	ND
DDD	–	0.39	–	ND
DDE	–	0.074	–	ND
Phosphorous	NA	–	280	–

SOURCE: E&E (July 1994, Tables 6–2 and 6–3)

KEY: NA = Not analyzed
ND = Not detected
R = Result rejected

TABLE 2-3
HUMAN HEALTH PRELIMINARY RISK EVALUATION SCREENING VALUES FOR SURFACE SOIL AND SEDIMENT

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

ANALYTE	USEPA Region III Residential RBC [1]	USEPA Region III Industrial RBC [1]	MCP S-1/GW-1 Soil Standard [2]	MCP S-1/GW-2 Soil Standard [2]	MCP S-1/GW-3 Soil Standard [2]	MCP S-2/GW-1 Soil Standard [2]	MCP S-2/GW-2 Soil Standard [2]	MCP S-2/GW-3 Soil Standard [2]
VOLATILE ORGANIC COMPOUNDS (mg/kg)								
1,1-Dichloroethane	7,800	200,000	3	100	100	3	400	500
1,2-Dichloroethane	7	63	0.05	0.2	10	0.05	0.2	20
1,2-Dichloroethene (cis)	780	20,000	2	100	100	2	500	500
1,2-Dichloroethene (trans)	1,600	41,000	4	500	500	4	800	1,000
1,1,1,2-Tetrachloroethane	25	220	0.4	0.5	4	0.4	0.5	5
1,1,2,2-Tetrachloroethane	3.2	29	0.02	0.2	0.5	0.02	0.2	0.6
1,1,1-Trichloroethane	7,000	180,000	30	100	100	30	500	500
1,1,2-Trichloroethane	11	100	0.3	2	2	0.3	3	3
2-Butanone	47,000	1E+06N	0.3	40	40	0.3	40	40
4-Methyl-2-pentanone	6,300	160,000	0.5	70	70	0.5	70	70
Acetone	7,800	200,000	3	60	60	3	60	60
Benzene	22	200	10	40	40	10	60	60
Bromodichloromethane	10	92	0.1	20	20	0.1	20	20
Carbon disulfide	7,800	200,000	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	4.9	44	1	4	7	1	4	10
Chlorobenzene	1,600	41,000	8	80	40	8	80	40
Chloroform	100	940	0.1	10	200	0.1	10	200
Ethylbenzene	7,800	200,000	80	500	500	80	1,000	500
Methylene chloride	85	760	0.1	100	100	0.1	200	200
Tetrachloroethylene	12	110	0.5	20	20	0.5	30	30
Trichloroethene	58	520	0.4	–	70	0.4	20	100
Toluene	16,000	410,000	90	500	500	90	500	1,000
Vinyl chloride	0.34	3	0.3	0.3	0.3	0.4	0.3	0.5
Xylene (total)	160,000	1E+06N	500	500	500	800	500	1,000
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)								
2-Methylnaphthalene	3,100	82,000	0.7	20	7	0.7	20	7
2-Methylphenol	3,900	100,000	NA	NA	NA	NA	NA	NA
4-Chloroaniline	310	8,200	1	100	30	1	400	30
4-Methylphenol	390	10,000	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	7,000	180,000	100	100	100	200	500	500
1,3-Dichlorobenzene	7,000	180,000	100	100	100	200	500	500
1,4-Dichlorobenzene	27	240	2	40	40	2	60	60
2,4-Dimethylphenol	1,600	41,000	0.7	400	10	0.7	900	10
2,4-Dinitrophenol	160	4,100	3	40	6	3	90	6
Acenaphthene	4,700	120,000	20	1,000	1,000	20	2,500	2,000
Acenaphthylene	2,300	61,000	100	100	100	100	2,500	800
Anthracene	23,000	610,000	1,000	1,000	1,000	1,000	2,500	1,000
Benzo (a) anthracene	0.88	7.8	0.7	0.7	0.7	1	1	1

TABLE 2-3
HUMAN HEALTH PRELIMINARY RISK EVALUATION SCREENING VALUES FOR SURFACE SOIL AND SEDIMENT

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

ANALYTE	USEPA Region III Residential RBC [1]	USEPA Region III Industrial RBC [1]	MCP S-1/GW-1 Soil Standard [2]	MCP S-1/GW-2 Soil Standard [2]	MCP S-1/GW-3 Soil Standard [2]	MCP S-2/GW-1 Soil Standard [2]	MCP S-2/GW-2 Soil Standard [2]	MCP S-2/GW-3 Soil Standard [2]
Benzo (a) pyrene	0.088	0.78	0.7	0.7	0.7	0.7	0.7	0.7
Benzo (b) fluoranthene	0.88	7.8	0.7	0.7	0.7	1	1	1
Benzo (g,h,i) perylene	2,300	61,000	100	1,000	100	100	2,500	100
Benzo (k) fluoranthene	8.8	78	7	7	7	10	10	10
Benzoic acid	310000	1E+06N	NA	NA	NA	NA	NA	NA
Bis(2-Ethylhexyl) phthalate	46	410	100	200	200	100	300	300
Carbazole	32	290	NA	NA	NA	NA	NA	NA
Chrysene	88	780	7	7	7	10	10	10
Dibenzofuran	310	8,200	NA	NA	NA	NA	NA	NA
Dibenzo(a,h) anthracene	0.088	0.78	0.7	0.7	0.7	0.7	0.7	0.7
Diethylphthalate	63,000	1E+06N	100	1,000	0.7	100	2,500	0.7
Dimethylphthalate	780000	1E+06N	30	1,000	0.7	30	2,500	0.7
Di-n-butylphthalate	7,800	200,000	100	1,000	0.7	100	2,500	0.7
Di-n-octylphthalate	1,600	41,000	100	1,000	0.7	100	2,500	0.7
Fluoranthene	3,100	82,000	600	1,000	600	600	2,000	600
Fluorene	3,100	82,000	400	1,000	1,000	400	2,000	1,000
Indeno (1,2,3-cd) pyrene	0.88	7.8	0.7	0.7	0.7	1	1	1
Isophorone	670	6,000	NA	NA	NA	NA	NA	NA
Naphthalene	3,100	82,000	4	100	100	4	1,000	1,000
N-Nitrosodiphenylamine	130	1,200	NA	NA	NA	NA	NA	NA
Phenanthrene	2,300	61,000	700	1,000	100	700	2,500	100
Phenol	47,000	1E+06N	60	500	500	60	800	500
Pentachlorophenol	5.3	48	5	7	7	5	10	10
Pyrene	2,300	61,000	500	700	500	500	2,000	500
PESTICIDES/PCBs (mg/kg)								
4,4'-DDD	2.7	24	2	2	2	3	3	3
4,4'-DDE	1.9	17	2	2	2	2	2	2
4,4'-DDT	1.9	17	2	2	2	2	2	2
Aldrin	0.038	0.34	0.03	0.03	0.03	0.04	0.04	0.04
Arodor-1016	5.5	140	2	2	2	2	2	2
Arodor-1242	0.083	0.74	2	2	2	2	2	2
Arodor-1248	0.083	0.74	2	2	2	2	2	2
Arodor-1254	1.6	41	2	2	2	2	2	2
Arodor-1260	0.083	0.74	2	2	2	2	2	2
BHC-alpha	0.1	0.91	0.1	0.4	0.4	0.1	0.6	0.5
BHC-beta	0.35	3.2	0.1	0.4	0.4	0.1	0.6	0.5
BHC-delta	0.35	3.2	0.1	0.4	0.4	0.1	0.6	0.5
BHC-gamma (lindane)	0.49	4.4	0.1	0.4	0.4	0.1	0.6	0.5
Chlordane-alpha	0.49	4.4	1	1	1	2	2	2

TABLE 2-3
HUMAN HEALTH PRELIMINARY RISK EVALUATION SCREENING VALUES FOR SURFACE SOIL AND SEDIMENT

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

ANALYTE	USEPA Region III Residential RBC [1]	USEPA Region III Industrial RBC [1]	MCP S-1/GW-1 Soil Standard [2]	MCP S-1/GW-2 Soil Standard [2]	MCP S-1/GW-3 Soil Standard [2]	MCP S-2/GW-1 Soil Standard [2]	MCP S-2/GW-2 Soil Standard [2]	MCP S-2/GW-3 Soil Standard [2]
Chlordane-gamma	0.49	4.4	1	1	1	2	2	2
Dieldrin	0.04	0.36	0.03	0.03	0.03	0.04	0.04	0.04
Endosulfan I	470	12,000	20	100	0.05	20	400	0.05
Endosulfan II	470	12,000	20	100	0.05	20	400	0.05
Endosulfan sulfate	0.8	0.8	20	100	0.05	20	400	0.05
Endrin	23	610	0.6	6	1	0.6	10	1
Endrin aldehyde	23	610	0.6	6	1	0.6	10	1
Endrin ketone	23	610	0.6	6	1	0.6	10	1
Heptachlor	0.14	1.3	0.1	0.1	0.1	0.2	0.2	0.2
Heptachlor epoxide	0.07	0.63	0.06	0.06	0.06	0.09	0.09	0.09
Methoxychlor	390	10,000	100	100	30	300	300	30
Toxaphene	0.58	5.2	NA	NA	NA	NA	NA	NA
Silvex	630	16,000	NA	NA	NA	NA	NA	NA
EXPLOSIVES (mg/kg)								
1,3-Dinitrobenzene	7.8	200	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	780	20,000	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	780	20,000	NA	NA	NA	NA	NA	NA
4-Nitrotoluene	780	20,000	NA	NA	NA	NA	NA	NA
Cyclonite (Rdx)	5.8	52	NA	NA	NA	NA	NA	NA
INORGANICS (mg/kg)								
Aluminum	78,000	1E+06N	NA	NA	NA	NA	NA	NA
Antimony	31	820	10	10	10	40	40	40
Arsenic	0.43	3.8	30	30	30	30	30	30
Barium	5,500	140,000	1,000	1,000	1,000	2,500	2,500	2,500
Beryllium	0.15	1.3	0.7	0.7	0.7	0.8	0.8	0.8
Cadmium	39	1,000	30	30	30	80	80	80
Calcium	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	390	10,000	200	200	200	600	600	600
Cobalt	4,700	120,000	NA	NA	NA	NA	NA	NA
Copper	2,900	76,000	NA	NA	NA	NA	NA	NA
Cyanide	1,600	41,000	100	100	100	100	100	100
Iron	NA	NA	NA	NA	NA	NA	NA	NA
Lead	400	400	300	300	300	600	600	600
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	390	10,000	NA	NA	NA	NA	NA	NA
Mercury	23	610	20	20	20	60	60	60
Molybdenum	390	10,000	NA	NA	NA	NA	NA	NA
Nickel	1,600	41,000	300	300	300	700	700	700

TABLE 2-3
HUMAN HEALTH PRELIMINARY RISK EVALUATION SCREENING VALUES FOR SURFACE SOIL AND SEDIMENT

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

ANALYTE	USEPA Region III Residential RBC [1]	USEPA Region III Industrial RBC [1]	MCP S-1/GW-1 Soil Standard [2]	MCP S-1/GW-2 Soil Standard [2]	MCP S-1/GW-3 Soil Standard [2]	MCP S-2/GW-1 Soil Standard [2]	MCP S-2/GW-2 Soil Standard [2]	MCP S-2/GW-3 Soil Standard [2]
Potassium	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	390	10,000	400	400	400	2,500	2,500	2,500
Silver	390	10,000	100	100	100	200	200	200
Sodium	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	6.3	160	8	8	8	30	30	30
Tin	47,000	1E+06N	NA	NA	NA	NA	NA	NA
Vanadium	550	14,000	400	400	400	2,000	2,000	2,000
Zinc	23,000	610,000	2,500	2,500	2,500	2,500	2,500	2,500
TOTAL PETROLEUM HYDROCARBONS (mg/kg)								
Total Petroleum Hydrocarbons	380	3,360	500	500	500	2,500	2,500	2,500
GENERAL CHEMISTRY (mg/kg)								
Phosphate	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	130,000	1E+06N	NA	NA	NA	NA	NA	NA
Nitrite	7,800	200,000	NA	NA	NA	NA	NA	NA

NOTES:

[1] Values are from USEPA Region III RBC table, October 20, 1995 (USEPA, 1995). RBCs are for residential or industrial soil and are based on a hazard quotient of 1 or an excess lifetime cancer risk of 1 in 1 million.

Value for pyrene used as a conservative surrogate for acenaphthylene, benzo(g,h,i)perylene, and phenanthrene.
Value for naphthalene used as a surrogate for 2-methylnaphthalene.
Values for Arodor-1242, -1248, -1260 based on value for PCBs.
Value for delta-BHC based on value for HCH-technical grade.
Value for alpha- and gamma-chlordane based on value for chlordane.
Value for endosulfan used for endosulfan I and II.
Value for endosulfan sulfate is the RCRA Action Level, Proposed Rule: RCRA Corrective Measures Study Action Level (FR:55, 27 July, 1990).
Value for endrin used for all endrin compounds.
Cyclonite (Rdx) synonym: hexahydro-1,3,5-trinitro-1,3,5-triazine.
Value for arsenic based on arsenic's properties as a carcinogen.
Value for chromium based on hexavalent chromium.
Value for cyanide based on free cyanide.
RBC is not available for lead; value is from Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites (OSWER Directive 9355.4-12).
Value for nickel based on nickel soluble salts.
Value for thallium based on thallium chloride.
RBC is not available for TPH. Values are screening values for gasoline derived by ABB-ES; derivation is documented in methodolgy section (Section 3.6.2).

[2] MCP Soil Standards published in 310 CMR 40.0975 (MADEP, 1995).

Value for diethylphthalate used for dimethylphthalate, di-n-butylphthalate, and di-n-octylphthalate.
Value for gamma BHC used for all BHC compounds.

TABLE 2-3
HUMAN HEALTH PRELIMINARY RISK EVALUATION SCREENING VALUES FOR SURFACE SOIL AND SEDIMENT

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

ANALYTE	USEPA Region III Residential RBC [1]	USEPA Region III Industrial RBC [1]	MCP S-1/GW-1 Soil Standard [2]	MCP S-1/GW-2 Soil Standard [2]	MCP S-1/GW-3 Soil Standard [2]	MCP S-2/GW-1 Soil Standard [2]	MCP S-2/GW-2 Soil Standard [2]	MCP S-2/GW-3 Soil Standard [2]

[1] Value for specific Arodors based on value for PCBs.
Value for alpha- and gamma-chlordane based on value for chlordane.
Value for endosulfan used for all endosulfan compounds.
Value for endrin used for all endrin compounds.
Value for chromium based on hexavalent chromium.
NA - Not available

TABLE 2–4
HUMAN HEALTH PRELIMINARY RISK EVALUATION SCREENING VALUES FOR GROUNDWATER AND SURFACE WATER

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

ANALYTE	Federal MCL[1]	MA MCL[2]	USEPA Region III RBC[3]	MCP GW–1 Groundwater Standard[4]	MCP GW–2 Groundwater Standard[4]	MCP GW–3 Groundwater Standard[4]
VOLATILE ORGANIC COMPOUNDS (µg/L)						
1,1–Dichloroethane	NA	70	810	70	9,000	50,000
1,2–Dichloroethane	5	5	0.12	5	20	50,000
1,2–Dichloroethene (cis)	70	70	61	70	NA	50,000
1,2–Dichloroethene (trans)	100	100	120	100	NA	50,000
1,1,1,2–Tetrachloroethane	NA	NA	0.41	5	6	50,000
1,1,2,2–Tetrachloroethane	NA	NA	0.052	2	20	20,000
1,1,1–Trichloroethane	200	200	1,300	200	4,000	50,000
1,1,2–Trichloroethane	5	5	0.19	5	20,000	50,000
2–Butanone	NA	350	1,900	350	50,000	50,000
4–Methyl–2–pentanone	NA	350	2,900	350	50,000	50,000
Acetone	NA	3,000	3,700	3,000	50,000	50,000
Benzene	5	5	0.36	5	2,000	7,000
Bromodichloromethane	100	100	0.17	5	NA	50,000
Carbon disulfide	NA	NA	1,000	NA	NA	NA
Carbon tetrachloride	5	5	0.16	5	20	50,000
Chlorobenzene	NA	100	39	100	1,000	500
Chloroform	100	100	0.15	5	400	10,000
Ethylbenzene	700	700	1300	700	30,000	4,000
Methylene chloride	5	5	4.1	5	50,000	50,000
Tetrachloroethylene	5	5	1.1	5	3,000	5,000
Trichloroethene	5	5	1.6	5	300	20,000
Toluene	1,000	1,000	750	1,000	6,000	50,000
Vinyl chloride	2	2	0.019	2	2	600
Xylene (total)	10,000	10,000	12,000	10,000	6,000	50,000
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)						
2–Methylnaphthalene	NA	NA	1,500	10	10,000	3,000
2–Methylphenol	NA	NA	1,800	NA	NA	NA
4–Chloroanlline	NA	NA	150	30	NA	50,000
4–Methylphenol	NA	NA	180	NA	NA	NA
1,2–Dichlorobenzene	600	600	270	600	10,000	8,000
1,3–Dichlorobenzene	600	NA	540	600	10,000	8,000
1,4–Dichlorobenzene	75	5	0.44	5	30,000	8,000
2,4–Dimethylphenol	NA	NA	730	100	NA	20,000

TABLE 2–4
HUMAN HEALTH PRELIMINARY RISK EVALUATION SCREENING VALUES FOR GROUNDWATER AND SURFACE WATER

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

ANALYTE	Federal MCL[1]	MA MCL[2]	USEPA Region III RBC[3]	MCP GW–1 Groundwater Standard[4]	MCP GW–2 Groundwater Standard[4]	MCP GW–3 Groundwater Standard[4]
2,4–Dinitrophenol	NA	NA	73	200	NA	2,000
Acenaphthene	NA	NA	2,200	20	NA	2,000
Acenaphthylene	NA	NA	1,100	300	NA	2,000
Anthracene	NA	NA	11,000	600	NA	600
Benzo (a) anthracene	NA	0.2	0.092	1	NA	5
Benzo (a) pyrene	0.2	0.2	0.0092	0.2	NA	2
Benzo (b) fluoranthene	NA	0.2	0.092	1	NA	7
Benzo (g,h,i) perylene	NA	NA	1,100	0.5	NA	0.5
Benzo (k) fluoranthene	NA	0.2	0.92	1	NA	1
Benzoic acid	NA	NA	150,000	NA	NA	NA
Bis(2–Ethylhexyl) phthalate	NA	6	4.8	6	700	30
Carbazole	NA	NA	3.4	NA	NA	NA
Chrysene	NA	0.2	9.2	2	NA	3
Dibenzofuran	NA	NA	150	NA	NA	NA
Dibenzo(a,h) anthracene	NA	0.2	0.0092	0.5	NA	0.5
Diethylphthalate	NA	NA	29,000	6,000	NA	30
Dimethylphthalate	NA	NA	370,000	50,000	NA	30
Di–n–butylphthalate	NA	NA	3,700	NA	NA	NA
Di–n–octylphthalate	NA	NA	730	NA	NA	NA
Fluoranthene	NA	NA	1,500	100	NA	100
Fluorene	NA	NA	1,500	300	NA	1,000
Indeno (1,2,3–cd) pyrene	NA	0.2	0.092	0.5	NA	0.5
Naphthalene	NA	NA	1,500	20	6,000	6,000
N–Nitrosodiphenylamine	NA	NA	14	NA	NA	NA
Phenanthrene	NA	NA	1,100	300	NA	50
Phenol	NA	NA	22,000	4,000	50,000	30,000
Pentachlorophenol	1	1	0.56	1	NA	80
Pyrene	NA	NA	1,100	80	NA	80
PESTICIDES/PCBs (µg/L)						
4,4'–DDD	NA	NA	0.28	0.1	NA	6
4,4'–DDE	NA	NA	0.2	0.1	NA	20
4,4'–DDT	NA	NA	0.2	0.3	NA	0.3
Aldrin	NA	NA	0.004	0.5	0.5	9
Aroclor–1016	0.5	0.5	2.6	0.5	NA	0.3
Aroclor–1242	0.5	0.5	0.0087	0.5	NA	0.3

TABLE 2-4
HUMAN HEALTH PRELIMINARY RISK EVALUATION SCREENING VALUES FOR GROUNDWATER AND SURFACE WATER

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

ANALYTE	Federal MCL[1]	MA MCL[2]	USEPA Region III RBC[3]	MCP GW-1 Groundwater Standard[4]	MCP GW-2 Groundwater Standard[4]	MCP GW-3 Groundwater Standard[4]
Aroclor-1248	0.5	0.5	0.0087	0.5	NA	0.3
Aroclor-1254	0.5	0.5	0.73	0.5	NA	0.3
Aroclor-1260	0.5	0.5	0.0087	0.5	NA	0.3
BHC-alpha	0.2	0.2	0.011	0.2	NA	0.8
BHC-beta	0.2	0.2	0.037	0.2	NA	0.8
BHC-delta	0.2	0.2	0.037	0.2	NA	0.8
BHC-gamma (lindane)	0.2	0.2	0.052	0.2	NA	0.8
Chlordane-alpha	2	2	0.052	2	NA	2
Chlordane-gamma	2	2	0.052	2	NA	2
Dieldrin	NA	NA	0.0042	0.1	NA	0.1
Endosulfan I	NA	NA	220	0.4	NA	0.1
Endosulfan II	NA	NA	220	0.4	NA	0.1
Endosulfan sulfate	NA	NA	220	0.4	NA	0.1
Endrin	2	2	11	2	NA	5
Endrin aldehyde	2	2	11	2	NA	5
Endrin ketone	2	2	11	2	NA	5
Heptachlor	0.4	0.4	0.0023	0.4	NA	1
Heptachlor epoxide	0.2	0.2	0.0012	0.2	NA	2
Methoxychlor	40	40	180	40	NA	2
Toxaphene	3	3	0.061	NA	NA	NA
Silvex	50	50	290	NA	NA	NA
EXPLOSIVES (µg/L)						
2-Nitrotoluene	NA	NA	61	NA	NA	NA
3-Nitrotoluene	NA	NA	61	NA	NA	NA
4-Nitrotoluene	NA	NA	61	NA	NA	NA
1,3-Dinitrobenzene	NA	NA	3.7	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	73	NA	NA	NA
Cyclonite (Rdx)	NA	NA	0.61	NA	NA	NA
Cyclotetramethylenetetranitramine (Hmx)	NA	NA	1,800	NA	NA	NA
INORGANICS (µg/L)						
Aluminum	200	200	37,000	NA	NA	NA
Antimony	6	6	15	6	NA	300
Arsenic	50	50	0.045	50	NA	400
Barium	2,000	2,000	2,600	2,000	NA	30,000

TABLE 2-4
HUMAN HEALTH PRELIMINARY RISK EVALUATION SCREENING VALUES FOR GROUNDWATER AND SURFACE WATER

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

ANALYTE	Federal MCL[1]	MA MCL[2]	USEPA Region III RBC[3]	MCP GW-1 Groundwater Standard[4]	MCP GW-2 Groundwater Standard[4]	MCP GW-3 Groundwater Standard[4]
Beryllium	4	4	0.016	4	NA	50
Boron	NA	NA	3,300	NA	NA	NA
Cadmium	5	5	18	5	NA	10
Calcium	NA	NA	NA	NA	NA	NA
Chromium	100	100	180	50	NA	100
Cobalt	NA	NA	2,200	NA	NA	NA
Copper	1,300	1,300	1,500	NA	NA	NA
Cyanide	200	200	730	200	NA	10
Iron	300	300	NA	NA	NA	NA
Lead	15	15	15	15	NA	30
Magnesium	NA	NA	NA	NA	NA	NA
Manganese	50	50	180	NA	NA	NA
Mercury	2	2	11	2	NA	1
Nickel	100	100	730	100	NA	80
Potassium	NA	NA	NA	NA	NA	NA
Selenium	50	50	180	50	NA	80
Silver	100	100	180	40	NA	7
Sodium	NA	20,000	NA	NA	NA	NA
Thallium	2	2	2.9	2	NA	400
Vanadium	NA	NA	260	50	NA	2,000
Zinc	5,000	5,000	11,000	2,000	NA	900
TOTAL PETROLEUM HYDROCARBONS (µg/L)						
Total Petroleum Hydrocarbons	NA	NA	NA	1,000	NA	50,000
WATER QUALITY PARAMETERS (µg/L)						
Alkalinity	NA	NA	NA	NA	NA	NA
Chloride	250,000	250,000	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA
Sulfate	250,000	250,000	NA	NA	NA	NA
Nitrate	10,000	10,000	58,000	NA	NA	NA
Nitrite	1,000	1,000	3,700	NA	NA	NA
Total Dissolved Solids	500,000	500,000	NA	NA	NA	NA
Total Suspended Solids	NA	NA	NA	NA	NA	NA

TABLE 2–4
HUMAN HEALTH PRELIMINARY RISK EVALUATION SCREENING VALUES FOR GROUNDWATER AND SURFACE WATER

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

ANALYTE	Federal MCL[1]	MA MCL[2]	USEPA Region III RBC [3]	MCP GW–1 Groundwater Standard [4]	MCP GW–2 Groundwater Standard [4]	MCP GW–3 Groundwater Standard [4]

NOTES:

[1] Federal MCL published in Drinking Water Regulations and Health Advisories, February 1996 (USEPA, 1996).
Current MCLs listed for bromodichloromethane and chloroform. 1994 Proposed rule for disinfectants and disinfection byproducts: total for all trihalomethanes combined cannot exceed 80 ppm.
Value for all Aroclors based on polychlorinated biphenyls.
Value for alpha– and gamma–chlordane based on chlordane.
Value for lindane used for all BHC compounds.
Value for endrin used for all endrin compounds.
Cyclonite (Rdx) synonym: hexahydro–1,3,5–trinitro–1,3,5–triazine.
Hmx synonym: octahydro–1,3,5,7–tetranitro–1,3,5,7–tetrazine.
Value for aluminum is a secondary MCL and represents the upper limit of the range (50 – 200 µg/L).
Value for copper is the treatment technique action level; the secondary MCL is 1000 µg/L.
Value for cyanide is a proposed MCL.
Value for iron is a secondary MCL.
Value for lead is the action level triggering treatment techniques.
Value for manganese is a secondary MCL.
Value for silver is a secondary MCL and a lifetime health advisory.
Value for zinc is a lifetime health advisory; the secondary MCL is 5000 µg/L.
Value for chloride is a secondary MCL.
Value for sulfate is a secondary MCL.
Value for TDS is a secondary MCL.

[2] Massachusetts MCL published in Drinking Water Standards & Guidelines for Chemicals in Massachusetts Drinking Waters, Autumn 1995 (MADEP, 1995).
Value for acetone is a guideline value.
Value for 2–butanone is a guideline value.
Value for 4–methyl–2–pentanone is a guideline value.
Value for 1,1–dichloroethane is a guideline value.
Values for bromodichloromethane and chloroform are based on total trihalomethanes (for chlorinated water supplies only).
Value for all carcinogenic PAHs based on benzo(a)pyrene.
Value for all Aroclors based on polychlorinated biphenyls.
Value for alpha– and gamma–chlordane based on chlordane.
Value for lindane used for all BHC compounds.
Value for endrin used for all endrin compounds.
Value for aluminum is a secondary MCL and represents the upper limit of the range (50 – 200 µg/L).
Value for copper is the treatment technique action level; the secondary MCL is 1000 µg/L.
Value for iron is a secondary MCL.

TABLE 2-4
HUMAN HEALTH PRELIMINARY RISK EVALUATION SCREENING VALUES FOR GROUNDWATER AND SURFACE WATER

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

ANALYTE	Federal MCL[1]	MA MCL[2]	USEPA Region III RBC[3]	MCP GW-1 Groundwater Standard[4]	MCP GW-2 Groundwater Standard[4]	MCP GW-3 Groundwater Standard[4]

Value for lead is the action level triggering treatment techniques.
Value for manganese is a secondary MCL.
Value for silver is a secondary MCL.
Value for sodium is a guideline value.
Value for zinc is a secondary MCL.
Value for chloride is a secondary MCL.
Value for sulfate is a secondary MCL.
Value for TDS is a secondary MCL.

[3] Values are from USEPA Region III RBC table, October 20, 1995 (USEPA, 1995).
RBCs are for tap water and are based on a hazard quotient of 1 or an excess lifetime cancer risk of 1 in 1 million.
Value for 2-methylnaphthalene based on naphthalene.
Value for acenapthylene, benzo(g,h,i)perylene, and phenanthrene based on pyrene.
Value for Aroclor-1242, -1248, and -1260 based on polychlorinated biphenyls.
Value for delta-BHC based on HCH-technical.
Value for alpha- and gamma-chlordane based on chlordane.
Value for endosulfan used for all endosulfan compounds.
Value for endrin used for all endrin compounds.
Value for arsenic based on arsenic's properties as a carcinogen
Value for chromium based on chromium VI.
Value for cyanide based on hydrogen cyanide.
RBC is not available for lead; value is the treatment technique action limit for lead in drinking water distribution systems identified in the Drinking Water Standards and Health Advisories (USEPA, 1994).
Value for thallium is based on value for thallium chloride.

[4] Massachusetts MCP Groundwater Standards published in 310 CMR 40.0974 (MADEP, 1995).
Value for all Aroclors based on polychlorinated biphenyls.
Value for gamma-hexachlorcyclohexane (lindane) used for all BHC compounds.
Value for alpha- and gamma-chlordane based on chlordane.
Value for endosulfan used for all endosulfan compounds.
Value for endrin used for all endrin compounds.
Value for chromium is based on value for hexavalent chromium.

NA = Not Available/Not Applicable

TABLE 2–5
ECOLOGICAL PRELIMINARY RISK EVALUATION SCREENING VALUES FOR SURFACE WATER AND SEDIMENT

SUPPLEMENTAL SITE INVESTIGATION
FORT DEVENS SUDBURY TRAINING ANNEX
SUDBURY, MASSACHUSETTS

ANALYTE	SEDIMENT SCREENING VALUES					SURFACE WATER SCREENING VALUES [f]	
	USEPA	NOAA [c]		ONTARIO MOE [d]		USEPA ACUTE	USEPA CHRONIC
	SQC [a] [b] (mg/kg)	ER–L (mg/kg)	ER–M (mg/kg)	LEL (mg/kg)	SEL [e] (mg/kg)	AWQC [g] (µg/l)	AWQC [g] (µg/l)
VOLATILE ORGANIC COMPOUNDS (µg/g)							
Benzene	NA	NA	NA	NA	NA	5,300 [h]	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	35,200 [h]	NA
chloroform	NA	NA	NA	NA	NA	28,900 [h]	1,240
1,2–Dichloroethane	NA	NA	NA	NA	NA	118,000 [h]	20,000 [h]
Dichloroethylenes	NA	NA	NA	NA	NA	11,600 [h]	NA
ethylbenzene	NA	NA	NA	NA	NA	32,000 [h]	NA
methylene chloride	NA	NA	NA	NA	NA	NA	NA
1,1,2,2–Tetrachloroethane	NA	NA	NA	NA	NA	NA	2,400
Tetrachloroethanes	NA	NA	NA	NA	NA	9,320 [h]	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	5,280 [h]	840 [h]
toluene	NA	NA	NA	NA	NA	17,500 [h]	NA
1,1,2–Trichloroethane	NA	NA	NA	NA	NA	NA	9,400 [h]
Trichloroethanes	NA	NA	NA	NA	NA	18,000 [h]	NA
Trichloroethylene	NA	NA	NA	NA	NA	45,000 [h]	21,900 [h]
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA
SEMIVOLATILE ORGANIC COMPOUNDS (µg/g)							
2–Methylnaphthalene	NA	0.065	0.67	NA	NA	NA	NA
2–Methylphenol	NA	NA	NA	NA	NA	NA	NA
4–Chloroaniline	NA	NA	NA	NA	NA	NA	NA
4–Methylphenol	NA	NA	NA	NA	NA	NA	NA
1,2–Dichlorobenzene	NA	NA	NA	NA	NA	1,120 [h]	763 [h]
1,3–Dichlorobenzene	NA	NA	NA	NA	NA	1,120 [h]	763 [h]
1,4–Dichlorobenzene	NA	NA	NA	NA	NA	1,120 [h]	763 [h]
2,4–Dimethylphenol	NA	NA	NA	NA	NA	2120 [h]	
2,4–Dinitrophenol	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	130	0.15	0.65	NA	NA	1,700 [h]	520 [h]
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA

TABLE 2-5
ECOLOGICAL PRELIMINARY RISK EVALUATION SCREENING VALUES FOR SURFACE WATER AND SEDIMENT

SUPPLEMENTAL SITE INVESTIGATION
FORT DEVENS SUDBURY TRAINING ANNEX
SUDBURY, MASSACHUSETTS

ANALYTE	SEDIMENT SCREENING VALUES					SURFACE WATER SCREENING VALUES [f]	
	USEPA	NOAA [c]		ONTARIO MOE [d]		USEPA ACUTE	USEPA CHRONIC
	SQC [a] [b] (mg/kg)	ER-L (mg/kg)	ER-M (mg/kg)	LEL (mg/kg)	SEL [e] (mg/kg)	AWQC [g] (µg/l)	AWQC [g] (µg/l)
Anthracene	NA	0.085	0.96	NA	NA	NA	NA
Benzo (a) anthracene	1317	0.23	1.6	NA	NA	NA	NA
Benzo (a) pyrene	1063	0.4	2.5	NA	NA	NA	NA
Benzo (b) fluoranthene	NA	NA	NA	NA	NA	NA	NA
Benzo (g,h,i) perylene	NA	NA	NA	NA	NA	NA	NA
Benzo (k) fluoranthene	NA	NA	NA	NA	NA	NA	NA
Benzoic acid	NA	NA	NA	NA	NA	NA	NA
Bis(2-Ethylhexyl) phthalate	NA	NA	NA	NA	NA	400 [i]	360 [i]
Carbazole	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	0.4	2.8	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h) anthracene	NA	0.06	0.26	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	940 [h]	3 [h]
Dimethylphthalate	NA	NA	NA	NA	NA	940 [h]	3 [h]
Di-n-butylphthalate	NA	NA	NA	NA	NA	940 [h]	3 [h]
Di-n-octylphthalate	NA	NA	NA	NA	NA	940 [h]	3 [h]
Fluoranthene	620	0.6	3.6	NA	NA	3,980 [h]	NA
Fluorene	NA	0.035	0.64	NA	NA	NA	NA
Indeno (1,2,3-cd) pyrene	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	0.34	2.1	NA	NA	2,300 [h]	620 [h]
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	180	0.225	1.38	NA	NA	30 [i]	6.3 [i]
Phenol	NA	NA	NA	NA	NA	10,200 [h]	2,560 [h]
Pentachlorophenol	NA	NA	NA	NA	NA	0 [j]	0 [j]
Pyrene	1311	0.35	2.2	NA	NA	NA	NA
Total PAHs	NA	4	35	2	11,000	NA	NA

TABLE 2–5
ECOLOGICAL PRELIMINARY RISK EVALUATION SCREENING VALUES FOR SURFACE WATER AND SEDIMENT

SUPPLEMENTAL SITE INVESTIGATION
FORT DEVENS SUDBURY TRAINING ANNEX
SUDBURY, MASSACHUSETTS

ANALYTE	SEDIMENT SCREENING VALUES					SURFACE WATER SCREENING VALUES [f]	
	USEPA	NOAA [c]		ONTARIO MOE [d]		USEPA ACUTE	USEPA CHRONIC
	SQC [a] [b] (mg/kg)	ER–L (mg/kg)	ER–M (mg/kg)	LEL (mg/kg)	SEL [e] (mg/kg)	AWQC [g] (µg/l)	AWQC [g] (µg/l)
PESTICIDES/PCBs (µg/g)							
4,4'–DDD	NA	0.002	0.02	0.008	6	0.06 [h]	NA
4,4'–DDE	NA	0.002	0.015	0.005	19	1,050 [h]	NA
4,4'–DDT	0.828	0.001	0.007	0.008	71	1.1	0.001
DDT–total	NA	0.003	0.35	0.007	12	NA	NA
Aldrin	NA	NA	NA	0.002	8	3	NA
Aroclor–1016	NA	NA	NA	0.007	53	NA	NA
Aroclor–1242	NA	NA	NA	NA	NA	NA	NA
Aroclor–1248	NA	NA	NA	0.03	150	NA	NA
Aroclor–1254	NA	NA	NA	0.06	34	NA	NA
Aroclor–1260	19.5	NA	NA	0.006	24	NA	NA
Aroclor–total	NA	0.05	0.4	0.07	530	2	0.014
BHC–alpha	NA	NA	NA	0.006	10	NA	NA
BHC–beta	NA	NA	NA	0.005	21	NA	NA
BHC–delta	NA	NA	NA	NA	NA	NA	NA
BHC–gamma (lindane)	0.157	NA	NA	0.003	1	2	0.08
Chlordane–alpha	NA	0.0005	0.006	0.007	6	2.4	0.0023
Chlordane–gamma	NA	0.0005	0.006	0.007	6	2.4	0.0023
Dieldrin	11	0.00002	0.008	0.002	91	2.5	0.0019
Endosulfan	NA	NA	NA	NA	NA	0.22	0.056
Endosulfan I	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA
Endrin	4.2	0.00002	0.045	0.003	130	0.18	0.0023
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA
Heptachlor	0.11	NA	NA	NA	NA	0.52	0.0038
Heptachlor epoxide	NA	NA	NA	0.005	5	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	0.03
Toxaphene	NA	NA	NA	NA	NA	0.73	0.0002
Silvex	NA	NA	NA	NA	NA	NA	NA

TABLE 2-5
ECOLOGICAL PRELIMINARY RISK EVALUATION SCREENING VALUES FOR SURFACE WATER AND SEDIMENT
SUPPLEMENTAL SITE INVESTIGATION
FORT DEVENS SUDBURY TRAINING ANNEX
SUDBURY, MASSACHUSETTS

ANALYTE	SEDIMENT SCREENING VALUES					SURFACE WATER SCREENING VALUES [f]	
	USEPA	NOAA [c]		ONTARIO MOE [d]		USEPA ACUTE	USEPA CHRONIC
	SQC [a] [b] (mg/kg)	ER-L (mg/kg)	ER-M (mg/kg)	LEL (mg/kg)	SEL [e] (mg/kg)	AWQC [g] (µg/l)	AWQC [g] (µg/l)
INORGANICS (µg/g)							
Aluminum	NA	NA	NA	NA	NA	750 [j]	87 [j]
Antimony	NA	2	25	NA	NA	88 [i]	30 [i]
Arsenic	NA	33	85	6	33	360	190
Barium	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	130 [h]	5.3
Cadmium	NA	5	9	0.6	10	3.9 [k]	1.1 [k]
Calcium	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	80	145	26	110	1,737 [k]	207 [k]
Cobalt	NA	NA	NA	50	NA	NA	NA
Copper	NA	70	390	16	110	18 [k]	12 [k]
Cyanide	NA	NA	NA	0.1	NA	22	5.2
Iron	NA	NA	NA	20,000	40,000	NA	1,000
Lead	NA	35	110	31	250	82 [k]	3 [k]
Magnesium	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	460	1100	NA	NA
Mercury	NA	0.15	1.3	0.2	2	2.4	0.012
Nickel	NA	30	50	16	75	1418 [k]	158 [k]
Potassium	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	1	2.2	NA	NA	20	5
Silver	NA	NA	NA	0.5	NA	4 [k]	0.12
Sodium	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	1,400 [h]	40 [h]
Tin	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	120	270	120	820	117 [k]	106 [k]

TABLE 2-5
ECOLOGICAL PRELIMINARY RISK EVALUATION SCREENING VALUES FOR SURFACE WATER AND SEDIMENT
SUPPLEMENTAL SITE INVESTIGATION
FORT DEVENS SUDBURY TRAINING ANNEX
SUDBURY, MASSACHUSETTS

ANALYTE	SEDIMENT SCREENING VALUES					SURFACE WATER SCREENING VALUES [f]	
	USEPA	NOAA [c]		ONTARIO MOE [d]		USEPA ACUTE	USEPA CHRONIC
	SQC [a] [b] (mg/kg)	ER-L (mg/kg)	ER-M (mg/kg)	LEL (mg/kg)	SEL [e] (mg/kg)	AWQC [g] (µg/l)	AWQC [g] (µg/l)
TOTAL PETROLEUM HYDROCARBONS (µg/g)							
Total Petroleum Hydrocarbons	NA	NA	NA	NA	NA	NA	NA
OTHER PARAMETERS (µg/g)							
Ammonia	NA	NA	NA	100	NA	NA	NA
Chloride	NA	NA	NA	NA	NA	860,000	230,000
Nitrate	NA	NA	NA	NA	NA	NA	NA
Nitrite	NA	NA	NA	NA	NA	NA	NA
Total Phosphorus	NA	NA	NA	600	2000	NA	NA
TKN	NA	NA	NA	550	4800	NA	NA

NOTES:

[a] Mean values from USEPA (1988, 1993) Sediment Quality Criteria (SQC) (in mg/kg organic carbon).

[b] Values for organic compounds will be carbon-normalized using site-specific total organic carbon concentration in sediments.

[c] Effects range-low (ER-L) and Effects range-median (ER-M) values from Long and Morgan (1990).
Value for chlordane used as a surrogate for alpha- and gamma-chlordane.

[d] Ontario Ministry of the Environment (MOE) values are Lowest Effect Level (LEL) and Severe-Effect Level (SEL) reported in Persaud, et al. (1992).
Value for chlordane used as a surrogate for alpha- and gamma-chlordane.

[e] Values for pesticides/PCBs will be carbon-normalized using site-specific total organic carbon concentrations in sediments.

[f] Surface water screening values include USEPA (1991) Ambient Water Quality Criteria for the protection of aquatic life (acute and chronic values) and Massachusetts Water Quali Criteria published in CMR 314.05 (12/1/93). Pursuant to guidance specified in CMR 314.05, Massachusetts WQC will be represented by USEPA (1991) chronic AWQC values.

[g] USEPA Acute and Chronic Ambient Water Quality Criteria (AWQC) reported in "Water Quality Criteria Summary" (USEPA, 1991).
AWQC for acute effects to freshwater aquatic life is the concentration (in ug/L) that shall not be exceeded as a 1-hour average more than once in 3 years.
AWQC for chronic effects to freshwater aquatic life is the concentration (in ug/L) that shall not be exceeded as a 4-day average more than once in 3 years.
Value for dichlorobenzenes used for all dichlorobenzene compounds.
Value for phthalate esters used for all phthalate ester compounds.
Value for chlordane used as a surrogate for alpha- and gamma-chlordane.

[h] Value is the Lowest Observe Effect Level (LOEL) reported in USEPA (1991).

[i] Value is a proposed criterion reported in USEPA (1991).

[j] pH-dependant criterion. Value presented is for pH units 6.5 to 9.0.

[k] Hardness-dependant criterion. AWQC value presented is for 100 mg/l hardness as $CaCO_3$. Criterion will be adjusted using site-specific hardness value, if available.

NA = Not Available.

TABLE 3-1
SURFACE WATER AND SEDIMENT SAMPLE RATIONALE

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

SITE ID	SAMPLE ID	LOCATION	RATIONALE AND PURPOSE
AREA OF CONTAMINATION A4 – WASTE DUMP			
JO-A04-D20 JO-A04-D21 JO-A04-D22	WXA0420X WXA0421X WXA0422X	75 feet east of location 4ASW5. Former sample location 4ASW5. 75 feet west of sample location 4ASW5.	Three surface water samples collected along a 150-foot-long transect centered on former sample location 4ASW5. Samples will be collected from standing water. If no water is present at the designated locations, no sample will be collected. Sediment samples will not be collected. Surface water samples will be analyzed for lead and hardness.
STUDY AREA P59 – CAN AREA			
JO-P59-D30 JO-P59-D31 JO-P59-D32 JO-P59-D33 JO-P59-D34 JO-P59-D35 JO-P59-D36 JO-P59-D37 JO-P59-D38 JO-P59-D39	DXP5930X DXP5931X DXP5932X DXP5933X DXP5934X DXP5935X DXP5936X DXP5937X DXP5938X DXP5939X	Ten sediment samples collected along a grid established over the area of visible debris and magnetic anomalies.	To evaluate the presence and distribution of potential contaminants in nonaqueous surface media in the disposal area. Surface water is not expected and will not be sampled if encountered. Samples collected outside of delineated wetland will be categorized as soil and will be renumbered within the sequence SXP5930X to SXP5939X (JO-P59-S30 to JO-P59-S39). Samples will be analyzed for PAL SVOCs, pesticides, and metals.

TABLE 3–2
MONITORING WELL INSTALLATION SUMMARY AND RATIONALE

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

SITE ID	DRILLING METHOD	EXPECTED WATER TABLE DEPTH (ft bgs)	BOTTOM DEPTH OF WELL SCREEN (ft bgs)	LENGTH OF WELL SCREEN (ft)	PURPOSE AND RATIONALE
AREA OF CONTAMINATION A7 – OLD GRAVEL PIT LANDFILL					
JO–A07–M61	6.25–inch–ID HSAs	2 to 5	12 to 15	10	One of three water–table monitoring wells installed outside of installation boundary, downgradient of area of identified groundwater contamination.
JO–A07–M62	6.25–inch–ID HSAs	2 to 5	12 to 15	10	One of three water–table monitoring wells installed outside of installation boundary, downgradient of area of identified groundwater contamination.
JO–A07–M63	6.25–inch–ID HSAs	2 to 5	12 to 15	10	One of three water–table monitoring wells installed outside of installation boundary, downgradient of area of identified groundwater contamination.
JO–A07–M64	6.25–inch–ID HSAs	2 to 5	Top of bedrock (est. 12 to 18 ft), or 50 ft, whichever is deeper.	10 (5–ft screen will be used if top of 10–ft screen would overlap screened depth of JO–A07–M63)	To be installed approximately 10 ft from water–table well JO–A07–M63, to compare conditions at depth to conditions at water table.
AREA OF CONTAMINATION A9 – POL BURN AREA					
JO–A09–M60	6.25–inch–ID HSAs	25	Screened at the depth of the highest soil concentration of chlorinated VOCs.	10	A monitoring well installed in boring JO–A09–B60 to look for possible free–phase chlorinated solvents. This monitoring well will be installed only if chlorinated VOCs are detected in soil (based on Data Quality Level II analytical results).

TABLE 3-3
MONITORING WELL / GROUNDWATER SAMPLE RATIONALE

SUPPLEMEMNTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

SITE ID	SAMPLE ID	LOCATION	RATIONALE AND PURPOSE
AREA OF CONTAMINATION A7 – OLD GRAVEL PIT LANDFILL			
OHM-A07-08	MXA07083	Existing on-site well located near trenches.	One of six existing wells to be resampled as part of one round of groundwater sampling/resampling, to assess groundwater quality on-site. To be analyzed for PAL VOCs and pesticides.
OHM-A07-09 OHM-A07-10 OHM-A07-12 OHM-A07-51 OHM-A07-52	MXA07092 MXA07102 MXA07122 MXA07512 MXA07522	Existing on-site wells located along northern site boundary, downgradient of disposal area.	Five of six existing wells to be resampled as part of one round of groundwater sampling/resampling, to assess groundwater quality on-site. To be analyzed for PAL VOCs and pesticides.
JO-A07-M61 JO-A07-M62 JO-A07-M63	MXA07611 MXA07621 MXA07631	New water-table wells installed off-site, downgradient of area of identified groundwater contamination.	Three of four new wells to be sampled as part of one round of groundwater sampling/resampling, to assess off-site groundwater quality downgradient of AOC A7. To be analyzed for PAL VOCs and pesticides.
JO-A07-M64	MXA07641	New monitoring well installed off-site at top of bedrock, downgradient of area of identified groundwater contamination.	One of four new wells to be sampled as part of one round of groundwater sampling/resampling, to assess off-site groundwater quality downgradient of AOC A7. To be analyzed for PAL VOCs and pesticides.
AREA OF CONTAMINATION A9 – POL BURN AREA			
OHM-A9-17 OHM-A9-55 OHM-A9-56 OHM-A9-58	MXA07175 MXA07555 MXA07565 MXA07585	Existing on-site wells associated with possible VOC plume.	To be sampled in one round of groundwater resampling, to assess groundwater quality at AOC A9. To be analyzed for PAL VOCs.
JO-A09-M60	MXA09601	New (optional) well installed to look for possible free- phase product below the water table.	To be sampled and analyzed for PAL VOCs.

TABLE 3–4
SURFACE SOIL LOCATION AND SAMPLE RATIONALE

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

SITE ID	SAMPLE ID	LOCATION AND RATIONALE
STUDY AREA P20 – BURNED AREA AND DRUM		
JO–P20–S10	SXP2010X	Twelve samples collected from grid pattern centered on sample P20S03, to assess lateral distribution of lead in soil. All samples to be analyzed in off–site laboratory for lead.
JO–P20–S11	SXP2011X	
JO–P20–S12	SXP2012X	
JO–P20–S13	SXP2013X	
JO–P20–S14	SXP2014X	
JO–P20–S15	SXP2015X	
JO–P20–S16	SXP2016X	
JO–P20–S17	SXP2017X	
JO–P20–S18	SXP2018X	
JO–P20–S19	SXP2019X	
JO–P20–S20	SXP2020X	
JO–P20–S21	SXP2021X	
P22 – OLD GRAVEL PIT		
JO–P22–S10	SX02210X	Four samples approximatley 10 feet from existing sample location P22S01. The samples will be collected north, east, south, and west of the former sample location. The samples will be submitted for laboratory analysis of PAL SVOCs.
JO–P22–S11	SX02211X	
JO–P22–S12	SX02212X	
JO–P22–S13	SX02213X	

TABLE 3–5
SOIL BORING LOCATION AND SAMPLE RATIONALE

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

SITE ID	DEPTH (ft bgs)	DRILLING METHOD	SAMPLE ID	LOCATION AND RATIONALE
AREA OF CONTAMINATION A7 – OLD GRAVEL PIT LANDFILL				
JO–A07–M61	12 to 15	6.25–inch HSAs	BXA07611	One of 3 water–table monitoring wells installed off–site, downgradient of area of identified contamination. To be sampled at 5–ft intervals, starting at 5 ft bgs. One sample from well–screen interval to be analyzed for TOC.
JO–A07–M62	12 to 15	6.25–inch HSAs	BXA07621	One of 3 water–table monitoring wells installed off–site, downgradient of area of identified contamination. To be sampled at 5–ft intervals, starting at 5 ft bgs. One sample from well–screen interval to be analyzed for TOC.
JO–A07–M63	12 to 15	6.25–inch HSAs	BXA07631	One of 3 water–table monitoring wells installed off–site, downgradient of area of identified contamination. To be sampled at 5–ft intervals, starting at 5 ft bgs. One sample from well–screen interval to be analyzed for TOC.
JO–A07–M64	12 to 15	6.25–inch HSAs	BXA07641	Monitoring well installed off–site at depth 50 ft bgs (or at top of bedrock, if shallower), downgradient of area of identified contamination. To be sampled at 5–ft intervals, starting at 5 ft bgs. One sample from well–screen interval to be analyzed for TOC.
AREA OF CONTAMINATION A9 – POL BURN AREA				
JO–A09–B60	Top of bedrock (est. 65 feet bgs)	6.25–inch HSAs	BXA09601 BXA09602 BXA09603 BXA09604 BXA09605 BXA09606	Boring installed down–dip from chlorinated VOC source area, to look for evidence of DNAPL. Monitoring well JO–A09–M60 will be installed in this borehole if chlorinated VOCs are found in soil. To be sampled at 10–ft intervals from ground surface to 40 ft bgs and at 5–ft intervals from 40 ft bgs to total depth. Samples from 40 ft bgs and below to be screened at Level II for chlorinated VOCs. Well to be installed if VOCs detected, screened at depth of highest concentration. Two confirmatory soil samples to be analyzed for PAL VOCs. One sample from screened interval (and also analyzed for TOC) and the other from interval with second highest Level II VOC concentration or (if there are no other VOC detects in the Level II samples) from interval immediately above the well screen. If chlorinated VOCs are not detected in any of the Level II samples, then the confirmatory samples will be from the deepest two samples soil intervals.

TABLE 3-5
SOIL BORING LOCATION AND SAMPLE RATIONALE

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

SITE ID	DEPTH (ft bgs)	DRILLING METHOD	SAMPLE ID	LOCATION AND RATIONALE
STUDY AREA P20 – BURNED AREA AND DRUM				
JO-P20-B01	8	4.25-inch HSAs	BXP20011 BXP20012	One soil boring drilled at former sample location P20S03, to assess vertical distribution of lead in soil. To be sampled 4-6 feet and 6-8 feet bgs. Samples to be analyzed in off-site laboratory for lead.

TABLE 3–6
TEST PIT LOCATION AND SAMPLE RATIONALE

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

SITE ID	SAMPLE ID	LOCATION	RATIONALE AND PURPOSE
STUDY AREA P59 – CAN AREA			
JO–P59–E01 JO–P59–E02 JO–P59–E03 JO–P59–E04 JO–P59–E05	EXP59011 EXP59021 EXP59031 EXP59041 EXP59051	One soil sample collected from each of 5 test pits excavated (using hand shovel) at geophysical anomalies with highest magnetic intensities.	Each of 5 samples to be collected from soil having overt evidence (staining and/or odor) of potential contamination, to evaluate presence and distribution of potential contamination associated with debris disposal. If there is no overt evidence, then from depth of observed debris. Samples to be analyzed in off–site laboratory for PAL SVOCs, pesticides, and metals.
JO–P59–E06 JO–P59–E07 JO–P59–E08 JO–P59–E09 JO–P59–E10	EXP59061 EXP59071 EXP59081 EXP59091 EXP59101	One soil sample collected from each of up to 5 test pits excavated (using hand shovel) at geophysical anomalies that do not correspond to any of the 5 highest magnetic anomalies but that do have overt evidence of potential contamination.	Each of up to 5 samples to be collected from soil having overt evidence (staining, odor, buried drums or other containers) of potential contamination, to evaluate presence and distribution of potential contamination associated with debris disposal. Samples to be analyzed in off–site laboratory for PAL SVOCs, pesticides, and metals.

TABLE 3–7
SAMPLING AND LABORATORY ANALYSIS SCHEDULE

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

SITE TYPE	FILE TYPE	MEDIA	SITE ID	FIELD SAMPLE ID	LAB SAMPLE NO.	DUP	MS/ MSD	PAL VOC	PAL SVOC	PAL PESTI–CIDES	PAL METALS	Pb	HARD–NESS	TOC
AREA OF CONTAMINATION A4 – WASTE DUMP														
SWAP	CSW	SURFACE WATER	JO–A04–D20	WXA0420X	SDW* 400			--	--	--	--	1	1	--
SWAP	CSW	SURFACE WATER	JO–A04–D21	WXA0421X	SDW* 401	1		--	--	--	--	1	1	--
SWAP	CSW	SURFACE WATER	JO–A04–D22	WXA0422X	SDW* 402		1	--	--	--	--	1	1	--
AREA OF CONTAMINATION A7 – OLD GRAVEL PIT LANDFILL														
BORE	CSO	SOIL (BORING)	JO–A07–M61	BXA07611	SDW* 403			--	--	--	--	--	--	1
BORE	CSO	SOIL (BORING)	JO–A07–M62	BXA07621	SDW* 404			--	--	--	--	--	--	1
BORE	CSO	SOIL (BORING)	JO–A07–M63	BXA07631	SDW* 405			--	--	--	--	--	--	1
BORE	CSO	SOIL (BORING)	JO–A07–M64	BXA07641	SDW* 406			--	--	--	--	--	--	1
WELL	CGW	GROUNDWATER	OHM–A07–08	MXA07083	SDW* 407			1	--	1	--	--	--	--
WELL	CGW	GROUNDWATER	OHM–A07–09	MXA07092	SDW* 408			1	--	1	--	--	--	--
WELL	CGW	GROUNDWATER	OHM–A07–10	MXA07102	SDW* 409	1		1	--	1	--	--	--	--
WELL	CGW	GROUNDWATER	OHM–A07–12	MXA07122	SDW* 410		1	1	--	1	--	--	--	--
WELL	CGW	GROUNDWATER	OHM–A07–51	MXA07512	SDW* 411			1	--	1	--	--	--	--
WELL	CGW	GROUNDWATER	OHM–A07–52	MXA07522	SDW* 412			1	--	1	--	--	--	--
WELL	CGW	GROUNDWATER	JO–A07–M61	MXA07611	SDW* 413			1	--	1	--	--	--	--
WELL	CGW	GROUNDWATER	JO–A07–M62	MXA07621	SDW* 414			1	--	1	--	--	--	--
WELL	CGW	GROUNDWATER	JO–A07–M63	MXA07631	SDW* 415			1	--	1	--	--	--	--
WELL	CGW	GROUNDWATER	JO–A07–M64	MXA07641	SDW* 416			1	--	1	--	--	--	--
AREA OF CONTAMINATION A9 – POL BURN AREA														
BORE	CSO	SOIL (BORING)	JO–A09–B60	BXA09601	SDW* 417	1	1	1	--	--	--	--	--	--
BORE	CSO	SOIL (BORING)	JO–A09–B60	BXA09602	SDW* 418			1	--	--	--	--	--	1
WELL	CGW	GROUNDWATER	OHM–A9–17	MXA09175	SDW* 419			1	--	--	--	--	--	--
WELL	CGW	GROUNDWATER	OHM–A9–55	MXA09555	SDW* 420			1	--	--	--	--	--	--

TABLE 3–7
SAMPLING AND LABORATORY ANALYSIS SCHEDULE

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

SITE TYPE	FILE TYPE	MEDIA	SITE ID	FIELD SAMPLE ID	LAB SAMPLE NO.	DUP	MS/ MSD	PAL VOC	PAL SVOC	PAL PESTI–CIDES	PAL METALS	Pb	HARD–NESS	TOC
WELL	CGW	GROUNDWATER	OHM–A9–56	MXA09565	SDW* 421			1	--	--	--	--	--	--
WELL	CGW	GROUNDWATER	OHM–A9–58	MXA09585	SDW* 422			1	--	--	--	--	--	--
WELL	CGW	GROUNDWATER	JO–A09–M60	MXA09601	SDW* 423			1	--	--	--	--	--	--
STUDY AREA P20 – BURNED AREA AND DRUM														
SURF	CSO	SOIL (SURFACE)	JO–P20–S10	SXP2010X	SDS* 424			--	--	--	--	1	--	--
SURF	CSO	SOIL (SURFACE)	JO–P20–S11	SXP2011X	SDS* 425			--	--	--	--	1	--	--
SURF	CSO	SOIL (SURFACE)	JO–P20–S12	SXP2012X	SDS* 426			--	--	--	--	1	--	--
SURF	CSO	SOIL (SURFACE)	JO–P20–S13	SXP2013X	SDS* 427			--	--	--	--	1	--	--
SURF	CSO	SOIL (SURFACE)	JO–P20–S14	SXP2014X	SDS* 428			--	--	--	--	1	--	--
SURF	CSO	SOIL (SURFACE)	JO–P20–S15	SXP2015X	SDS* 429			--	--	--	--	1	--	--
SURF	CSO	SOIL (SURFACE)	JO–P20–S16	SXP2016X	SDS* 430			--	--	--	--	1	--	--
SURF	CSO	SOIL (SURFACE)	JO–P20–S17	SXP2017X	SDS* 431	1		--	--	--	--	1	--	--
SURF	CSO	SOIL (SURFACE)	JO–P20–S18	SXP2018X	SDS* 432		1	--	--	--	--	1	--	--
SURF	CSO	SOIL (SURFACE)	JO–P20–S19	SXP2019X	SDS* 433			--	--	--	--	1	--	--
SURF	CSO	SOIL (SURFACE)	JO–P20–S20	SXP2020X	SDS* 434			--	--	--	--	1	--	--
SURF	CSO	SOIL (SURFACE)	JO–P20–S21	SXP2021X	SDS* 435			--	--	--	--	1	--	--
BORE	CSO	SOIL (BORING)	JO–P20–B01	BXP20011	SDS* 436			--	--	--	--	1	--	--
BORE	CSO	SOIL (BORING)	JO–P20–B01	BXP20012	SDS* 437			--	--	--	--	1	--	--
P22 – OLD GRAVEL PIT														
SURF	CSO	SOIL(SURFACE)	JO–P22–S10	SX02210X	SDS* 438	1		--	1	--	--	--	--	--
SURF	CSO	SOIL(SURFACE)	JO–P22–S11	SX02211X	SDS* 439		1	--	1	--	--	--	--	--
SURF	CSO	SOIL(SURFACE)	JO–P22–S12	SX02212X	SDS* 440			--	1	--	--	--	--	--
SURF	CSO	SOIL(SURFACE)	JO–P22–S13	SX02213X	SDS* 441			--	1	--	--	--	--	--
STUDY AREA P59 – CAN AREA														

TABLE 3-7
SAMPLING AND LABORATORY ANALYSIS SCHEDULE

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

SITE TYPE	FILE TYPE	MEDIA	SITE ID	FIELD SAMPLE ID	LAB SAMPLE NO.	DUP	MS/ MSD	PAL VOC	PAL SVOC	PAL PESTI-CIDES	PAL METALS	Pb	HARD-NESS	TOC
SWAP	CSE	SEDIMENT	JO-P59-D30	DXP5930X	SDS* 442		1	--	1	1	1	--	--	1
SWAP	CSE	SEDIMENT	JO-P59-D31	DXP5931X	SDS* 443			--	1	1	1	--	--	1
SWAP	CSE	SEDIMENT	JO-P59-D32	DXP5932X	SDS* 444			--	1	1	1	--	--	1
SWAP	CSE	SEDIMENT	JO-P59-D33	DXP5933X	SDS* 445			--	1	1	1	--	--	1
SWAP	CSE	SEDIMENT	JO-P59-D34	DXP5934X	SDS* 446	1		--	1	1	1	--	--	1
SWAP	CSE	SEDIMENT	JO-P59-D35	DXP5935X	SDS* 447			--	1	1	1	--	--	1
SWAP	CSE	SEDIMENT	JO-P59-D36	DXP5936X	SDS* 448			--	1	1	1	--	--	1
SWAP	CSE	SEDIMENT	JO-P59-D37	DXP5937X	SDS* 449			--	1	1	1	--	--	1
SWAP	CSE	SEDIMENT	JO-P59-D38	DXP5938X	SDS* 450			--	1	1	1	--	--	1
SWAP	CSE	SEDIMENT	JO-P59-D39	DXP5939X	SDS* 451			--	1	1	1	--	--	1
EXCV	CSO	SOIL (TEST PIT)	JO-P59-E01	EXP59011	SDS* 452			--	1	1	1	--	--	--
EXCV	CSO	SOIL (TEST PIT)	JO-P59-E02	EXP59021	SDS* 453			--	1	1	1	--	--	--
EXCV	CSO	SOIL (TEST PIT)	JO-P59-E03	EXP59031	SDS* 454			--	1	1	1	--	--	--
EXCV	CSO	SOIL (TEST PIT)	JO-P59-E04	EXP59041	SDS* 455			--	1	1	1	--	--	--
EXCV	CSO	SOIL (TEST PIT)	JO-P59-E05	EXP59051	SDS* 456			--	1	1	1	--	--	--
EXCV	CSO	SOIL (TEST PIT)	JO-P59-E06	EXP59061	SDS* 457			--	1	1	1	--	--	--
EXCV	CSO	SOIL (TEST PIT)	JO-P59-E07	EXP59071	SDS* 458			--	1	1	1	--	--	--
EXCV	CSO	SOIL (TEST PIT)	JO-P59-E08	EXP59081	SDS* 459			--	1	1	1	--	--	--
EXCV	CSO	SOIL (TEST PIT)	JO-P59-E09	EXP59091	SDS* 460			--	1	1	1	--	--	--
EXCV	CSO	SOIL (TEST PIT)	JO-P59-E10	EXP59101	SDS* 461			--	1	1	1	--	--	--
					SOIL SAMPLE SUBTOTAL			2	24	20	20	14	0	15
					WATER SAMPLE SUBTOTAL			15	0	10	0	3	3	0

TABLE 3–7
SAMPLING AND LABORATORY ANALYSIS SCHEDULE

SUPPLEMENTAL SITE INVESTIGATION WORK PLAN
SUDBURY ANNEX

SITE TYPE	FILE TYPE	MEDIA	SITE ID	FIELD SAMPLE ID	LAB SAMPLE NO.	DUP	MS/ MSD	PAL VOC	PAL SVOC	PAL PESTI–CIDES	PAL METALS	Pb	HARD–NESS	TOC
	DUPLICATES (5%)			SOIL				1	2	1	1	1	0	1
				WATER				1	0	1	1	1	1	0
	MATRIX SPIKE / MATRIX SPIKE DUPLICATES (5%)			SOIL				1	2	1	1	1	0	1
				WATER				1	0	1	1	1	1	0
	RINSATE BLANKS (5%)			FOR SOIL (water matrix)				1	2	1	1	1	0	1
				FOR WATER				1	0	1	1	1	1	0
	TRIP BLANKS			WATER				2	0	0	0	0	0	0
				SOIL SAMPLE TOTAL				**4**	**28**	**22**	**22**	**16**	**0**	**17**
				WATER SAMPLE TOTAL				**21**	**2**	**14**	**4**	**7**	**6**	**1**